JPRS 78761

17 August 1981

China Report

ECONOMIC AFFAIRS

No. 161

Energy: Status and Development

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ENERGY: STATUS AND DEVELOPMENT

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ENERGY WASTE SITUATION, CONSERVATION MEASURES EXAMINED

Lowering Energy Consumption

Beijing RENMIN RIBAO in Chinese 21 May 81 p 5

[Article by Lei Xilu [7191 6932 4389]: "Lowering Energy Consumption as a Strategy of Economic Readjustment"]

[Text] Energy resources constitute the important material foundation for the development of social production and improvement of people's lives. The development of China's energy resources has advanced rapidly since establishment of the nation. In 1979 the total energy production (including coal, oil, natural gas and hydroelectric power) was equivalent to 640 million tons of standard coal, which was 11.4 times that in 1953, amounting to an average annual growth rate of 10.1 percent. However, the energy supply has registered a significant shortage in recent years and has been insufficient to meet the needs of national economic development, so that the industrial production capability could not be fully developed and this resulted in a heavy economic loss. Therefore, insufficient energy has rapidly become a key question related to development of the national economy. What are the major causes of energy shortage? How do we solve the problems of energy shortage? This article will discuss these problems.

Large Energy Consumption Is One of the Major Causes of Energy Shortage in China

Energy consumption has increased very rapidly in China since the establishment of the nation. In 1979 the total energy consumption was equivalent to 586 million tons of standard coal (referring to commodity energy only, excluding noncommodity energy such as waste matter and wood used in rural villages), which was 9.8 times of that in 1953. It was the third largest energy consumption in the world, exceeded only by the United States (2.502 billion tons) and the Soviet Union (1.445 billion tons).

China's energy consumption was greater than that during the period of the first 5-year plan and much greater than in foreign countries. For example, in 1979 the consumption of standard coal per 100 million yuan of national income was 174,000 tons, a 98.5-percent increase over the average of 91,800 tons during the period of the first 5-year plan and a 27.9-percent increase over the 136,000-ton consumption in 1965. Comparing the energy consumption in China with that in

foreign countries: in 1978 Japan's energy consumption was 77.2 percent of China's and its national income was 4.6 times that of China; the total U.S. energy consumption was 4.4 times China's and its national income was 10.9 times; the total Soviet energy consumption was 2.5 times and its national income was 3.2 times; and the total energy consumption of West Germany, England, and France was 64.9, 51.1 and 42 percent of China's, respectively, and their national incomes were 3.2, 1.6 and 2.4 times that of China, respectively. Calculated on the basis of energy consumption (in terms of standard coal) per $100 million, China's energy consumption was the highest of all.

Let us further compare China's and Japan's energy consumption and the production of a number of major products. In 1978, Japan's total energy consumption was 439 million tons of standard coal, amounting to only 77.2 percent of China's, while Japan's steel production (102.11 million tons) was 3.2 times that of China, automobile production (9.27 million vehicles), 6.5 times; electric power generation (495.2 billion units), 1.9 times; and tractor production (310,000 vehicles), 1.9 times. The energy consumption and the production of a number of major products in the United States, the Soviet Union, West Germany, England, and France compared with China's were approximately the same in scale.

The Major Causes of High Energy Consumption in China Today

1. Low Energy Utilization Rate. Energy consumption consists of two major parts: one part effectively utilized and one part wasted. The effective utilization rate of energy in China is only 28-30 percent, and the rest, 70 percent or so, consists of waste heat and loss. The effective utilization rate of energy in Japan is more than 50 percent, and in the European Community nations, 42 percent or so. If China's energy utilization rate could be increased from the present 28 percent to the level of Japan today, approximately 200 million tons of standard coal could be saved a year.

The reasons why China's energy utilization rate is so low include the following:

First of all, the standard of energy management is low, with consequent serious energy waste. Due to neglect and a low standard of management, the loss of gas, water, and oil due to leakage is a common phenomenon in the vast majority of plants, and loss of electric power and thermal power is also significant.

The unit energy consumption of 38 kinds of major products during the first 6 months of 1980 as determined by a national survey was found to be below 60 percent of the best historical level. The difference in energy consumption among different enterprises of the same occupation is also quite large. For example, among China's 50 medium-size chemical fertilizer plants, the average coal consumption per ton of synthetic ammonia was 2.77 tons for the period January-May 1979. Among them, the Quzhou Chemical Fertilizer Plant in Zhejiang Province consumed only 2.214 tons. If all other plants could reach the standard of the Quzhou Chemical Fertilizer Plant, 1.8 million tons of coal could be saved a year.

There are as many as 4,000 heat-treatment factories and construction sections among 6,000 enterprises belonging to the First Ministry of Machine Building system,

with a total electric furnace capacity of 1.34 million kW. Some plants use these facilities less than once every 2-3 days, wasting a large amount of electricity. If these plants could be reorganized to take advantage of cooperative ppecialization, the number of heat-treatment factories (or construction sections) could be reduced more than 50 percent and a large amount of energy could be saved.

Second, energy resources have not been systematically utilized. Generally speaking, the most efficient way is joint thermoelectric application--generating electricity first, supplying heat later. The waste heat and the coal gas produced as a byproduct of industrial production have not been sufficiently utilized. According to a preliminary estimate, the nationwide usable industrial waste heat amounts to 50 million tons of standard coal, and only about 10 percent of it is being utilized today. The coal gas generated from the blast furnaces and coke furnaces in China's key steel enterprises amounts to approximately 8.7 billion cubic meters a year and the oil field gas generated by the oil industry reaches 5 billion cubic meters a year. These gases are not utilized, and this is equivalent to a loss of 2 million tons of standard coal or 2.8 million tons of raw coal a year.

Third, outdated technology and equipment constitutes another very important reason why China's energy utilization rate is low. According to a preliminary study of more than 26,000 different kinds of electromechanical products manufactured by plants belonging to the First Ministry of Machine Building, 55 percent are 1940-50 models, and 3,200 kinds of popular products are manufactured in large quantities which are known to consume a large quantity of energy and are low in efficiency. The domestic internal combustion engines consume 10-20 percent more fuel than the foreign made, thus wasting more than 3 million tons of oil a year. The efficiencies of various kinds of machinery and pumps are on average approximately 10 percent lower than the foreign made, thus wasting more than 10 billion units of electricity a year. The thermal efficiency of the existing 180,000-190,000 industrial furnaces is only approximately 50 percent, consuming approximately 200 million tons of coal a year. Compared with the thermal efficiency of 70-80 percent achieved by the industrially advanced nations, China is wasting 30-50 million tons of coal a year.

Fourth, irrational distribution and utilization of energy creates large waste. For example, railroad locomotives should use lump coal or molded coal, but raw coal is being used today. As a result, the loss rate is 7 percent more than if lump coal or molded coal were used. Chemical fertilizer plants should use medium lump anthracite, but what is supplied to the plants today consists for the most part of unsieved, small lump coal, with an increase in consumption of 25-30 percent, amounting to a waste of more than 5 million tons of coal a year.

2. Irrational Economic Structure

The structure of the national economy has a great effect on energy consumption. Within the national economy, industrial circles consume the most energy, especially the metallurgical and chemical fertilizer industries. The light industry and transportation sections consume less energy, and the agriculture, commerce,

services, and travel consume the least energy. One of the important reasons why China's energy consumption today is greater than during the period of the first 5-year plan and the period of readjustment from 1963 to 1965 is the fact that heavy industries which consumed great amounts of energy were developed too fast. For example, between 1953 and 1979, the average annual growth rate was 10.1 percent for energy, 12.7 percent for the metallurgical industry, and 17.7 percent for the chemical industry, including 26.6 percent for the chemical fertilizer and pesticide industries. The specific weight of heavy industry among all industry increased steadily. A larger part of China's energy resources is consumed by heavy industry today because of its disproportionately large specific weight. For example, in 1979, 28 percent of the national income was contributed by heavy industry, which was responsible for approximately 60 percent of the total national energy consumption. On the other hand, 18 percent of the national income was contributed by light industry, which was responsible for only 10 percent of the total national energy consumption. Thus, the limited amount of oil was not properly utilized to achieve the maximum economic effect.

Since the readjustment of the proportional relationships was started in 1979, its effect on energy conservation has already been seen. Comparing 1980 with 1979, the specific weight of light industrial production in the total industrial production increased from 43.1 to 46.9 percent. And 22 million tons of standard coal were saved as a result of this measure and the reorganization of the products structure within the industry. Based on a rough estimate, 6 million tons or so of standard coal could be conserved for every 1 percent rise in the specific weight of light industry in the entire industry. Therefore, a systematic and gradual increase in the specific weight of light industry is an important effective measure to decrease the energy consumption level.

3. "Five Small" Enterprises Consume Too Much Energy With Much Waste

In 1979, medium and small enterprises occupied 99 percent of China's total industrial enterprises and produced 56 percent of the total industrial output. At present, most of these small enterprises consume too much energy and account for a great deal of waste. In the field of metallurgical industry, the energy consumption per ton of pig iron by medium- and small-scale enterprises was more than 100 jin more than the key iron and steel plants, thus wasting more than 1 million tons of standard coal a year.

In the field of chemical industry, the synthetic ammonia industry consumes 50 percent of the energy. Large plants imported from abroad using oil and gas as raw materials consume on average 1.43 tons of standard coal per ton of synthetic ammonia, while the small ammonia fertilizer plants using mainly coal and coke as raw materials consume 3.71 tons of standard coal per ton of synthetic ammonia. The small enterprises thus waste more than 10 million tons of standard coal a year compared with the usage of the large imported plants.

Energy Conservation Is an Important Means of Solving the Energy Shortage

The measures to solve the energy shortage problem consist of development and conservation. During the period of readjustment, conservation is more important.

During 1980, while the energy supply decreased 2.9 percent, industrial production increased 8.7 percent. This feat was accomplished mainly by energy conservation. During the period of the sixth 5-year plan the total supply of energy is expected to decrease further, so if we want to maintain a steady rate of national economic growth we must work harder on energy conservation. During the period of readjustment and for an even longer period afterward, we must make energy conservation one of the key measures for the development of the national economy. We must carry out technological renovation and structural reconstruction of our national economy centered around energy conservation and aggressively fight the battle of energy conservation.

Among various energy conservation activities, conservation of oil has even greater significance. Today, when there is a shortage of oil supply in the world and the oil price is rising rapidly, every country attaches great importance to oil conservation. In 1979, 84 percent of China's crude oil production was consumed domestically with great waste. How effectively we can utilize this amount of oil has a profound significance. If we can conserve 10 million tons of oil by any effective conservation measure and export that oil, we will be able to earn more than $2 billion in foreign exchange, which can be used to import facilities and technologies which are urgently needed by the national construction. This will have a significant effect on China's realization of the "four modernizations."

During the past 2 years, the energy conservation efforts exerted by everyone, from the party Central Committee to the local district, have already shown some definite results. But this is only the beginning. There is still a great latent potential for further conservation.

What measures of energy conservation should we emphasize? Based on the experiences gained by the domestic advanced energy conservation units and thos of foreign countries, we must emphasize activities in the following areas:

First of all, we must strengthen the ideological work. The energy situation must be explained and various forms of wasting energy must be presented to the workers and the people, and then the methods of solving these problems must be explained to them. Everybody must be made to understand the close relationship between energy conservation and China's "four modernizations" construction and also the effect of energy conservation on improving and raising the national standard of living, so that he will willingly practice energy conservation.

Second, energy management must be strengthened. The energy management structure must be established and strengthened from top to bottom. So that energy management, distribution, and utilization can be governed by short-range as well as long-range energy conservation plans, measures, guidelines, and policies must be drawn up and implemented systematically. Each year the government must publish the goals and tasks that are expected to be accomplished by each department, district, and enterprise. The government must implement a measure on supplying energy to enterprises according to a norm in exchange for a coupon, and likewise from the enterprise to its factories. After the basis of norm management is well established, we must gradually experiment with a fixed amount of energy undertaking. Excess use of energy will not be replenished, or it will be

replenished at an added price. We must establish a system of post responsibility so as to eliminate completely the loss of thermal energy, waste of electric power, and loss of gas, water, and oil due to lack of a sense of work responsibility. Energy conservation must be made one of the items on which an enterprise is evaluated. It must be made part of the routine; it must be systematized and popularized.

Third, new technologies, new materials, and new experiences related to energy conservation must be pursued and developed aggressively in order to raise the standard of energy conservation. Any new technology, new material and new experience acquired by any enterprise must be expanded and applied to its production process and to the renovation of energy conservation measures. Relatively inexpensive and simple measures with mature technology from which quick results can be obtained must be popularized first of all. Those measures which are more complex and more expensive and require a longer period of reconstruction must be popularized gradually after experimenting with them.

Fourth, the outdated facilities and technologies must be renovated with energy conservation as the central theme, and old facilities which waste too much energy should be eliminated gradually. At the same time, research and trial construction of high-efficiency energy-saving equipment must be pushed forward aggressively.

Fifth, the economic structure must be reorganized one step further. During the process of reorganizing the economic structure, we must accelerate the development of those sections which consume less energy, including agriculture, light industry, commerce, services, travel, and construction industry, so that their specific weights in the national economy will be increased further. Thus, not only will energy be significantly conserved but also the market will be stabilized, people's lives will be improved, and financial income will be increased. While the economic structure is being reorganized, the products structure within enterprises must also be reorganized. Those small enterprises which waste energy, have large losses and produce low-quality, unattractive products must be systematically reorganized.

Sixth and last, economic policies related to energy conservation must be researched and developed, especially economic policies which will promote conservation of oil and reduce the use of oil for fuel.

In addition, the development of methane gas, forest for firewood and charcoal, small hydroelectric power generation, renovation and development of small coal mines in rural areas, together with utilization of solar energy and wind power, are all effective measures for solving the problems related to energy shortage.

9113
CSO: 4006/330

Resource Measurement, Testing Work

Fuzhou FUJIAN RIBAO in Chinese 11 May 81 p 2

[Article by Cao Jichuan [2580 1323 1557], deputy director of Fujian Province Survey Bureau: "Stressing Energy Resource Measurement and Testing Work"]

[Text] Conservation is an extremely important task in the period of national economic readjustment. To a large extent, the effectiveness of conservation has an effect on the speed of economic development in Fujian Province, and the conservation effort must succeed. In the effort to conserve energy, if the method of measurement is not stressed or if the measurement methods used are not accurate, then just general talk about stepping up management will not achieve the required conservation.

Measurement and testing are the basic techniques in energy resource management. Over the years, the testing and measurement work at Fujian's factory and mining enterprises has been rather weak. Among the 11 large enterprises in the province, only 4 have established a measurement department. In some plants, although there are measurement departments, they are not in charge of the general measurement work of the entire plant. In other cases, the measurement departments are short of manpower, have too many new members and obsolete equipment and apparatus. Today there are a number of plants, mines, harbors and stations in Fujian where the incoming and outgoing amounts of coal, oil and electricity and the energy consumption within the plants and mines generally lack accurate measurement. In some cases, the accounting with regard to electricity, oil, coal and gas is a complete mess. With such confusion in energy consumption, it is difficult to evaluate the conservation or waste of energy resources. Just a 1-percent error of 5 million kilowatt-hours is equal to 50,000 kilowatt-hours! If these conditions are not improved, conservation work undoubtedly will be adversely affected.

To solve the problem of measurement and testing for large energy consumers, the first step is to install the proper meters and equipment according to the needs of the profession and enterprise. In June 1980, the State Economic Commission held a work conference forum and decided to complete the installation of measurement equipment and meters and testing procedures for the nation's large- and medium-scale enterprises within a period of 2 years or s . It was also decided that in the future, energy resource supplies will be restricted at those enterprises without complete measurement equipment, meters and testing procedures. Such enterprises will not be regarded as progressive, and in the event of an energy resource dispute, they will have to assume t[illegible]onomic responsibilities. This is an important measure for realizing energy conservation and is part of the capital construction at plants and mining enterprises. It should be carefully investigated and studied and practical arrangements should be made and steps carried out according to the urgency of the matter.

With increased measurement and testing practice in plants and mining enterprises, the fundamental technical work at various measurement departments should be stepped up correspondingly. In Fujian Province, the measurement work had a late start, and a weak foundation; the great majority of local and municipal measurement

offices were established within the last 1 or 2 years. Due to the lack of funds, many items of standard equipment in measurement and testing cannot be purchased and the measurement and testing work for energy conservation is difficult to develop. If the various measurement institutes cannot gradually establish their energy resource measurement standards, complete their conservation measurement and testing procedures, and greatly improve the conservation-related measurement standards and the operating condition, accuracy and stability of various types of equipment and meters, then it will be impossible to calibrate and service the conservation-related measurement and testing equipment and meters in plants and mines to keep them constantly accurate and consistent. Energy resource measurement standards should be established; electrical energy and petroleum flow standards are closely related to conservation and should be established; thermal equilibrium testing should be carried out; and calibration and service problems of energy measurement devices closely related to people's livelihood should be resolved. The measurement departments should tighten their control over expenses and put the limited funds into this urgent area. In addition, strong support from other departments is needed to resolve the problems together.

Energy resources are vitally important to the four modernizations of China and to the development of the society and the economy. The nation is now taking a series of measures to keep the conservation effort going. We therefore suggest that various levels of government and relevant departments stress and step up the leadership for measurement and testing work, help solve actual problems and let this work play its proper role and make its contribution to energy conservation.

9698
CSO: 4006/352

Role of Banks

Beijing ZHONGGUO JINRONG [CHINESE FINANCE] No 1, 1981 pp 27-29

[Article by Bing Shenghai [6728 4141 3189]: "Promote Conservation and Development of Energy Resources by Properly Using Credits and Loans"]

[Text] The energy resource problem is an important issue in today's economic life and it is also closely related to the national economic readjustment and the four modernizations. To a large degree the speed of carrying out the four-modernization program is dependent upon the solution of energy resource problems. In Liaoning Province, sharp conflicts exist in energy supply and demand, and the various levels of party and government authorities are devoting great attention to the development and conservation of energy resources. At present the emphasis is on conservation, and corresponding measures are being taken to strengthen the guidance. Banks should play their professional role actively and sufficiently to provide monetary support to the nation in carrying out the plans for energy resource conservation and development and should be promoters of conservation and development.

Raise Awareness About Energy Conservation

Energy resources are the prime moving force for material production. To carry out the four modernizations we need a corresponding supply of energy resources. China is rich in energy resources and has made considerable achievements in energy development and construction since the revolution. However, due to the interference and destruction by Lin Biao and the "gang of four" for more than 10 years, the development of energy resources is seriously out of tune with demand, the management of energy is chaotic, the effective utilization rate of thermal energy is low, and the loss and waste in coal, oil, and electricity are alarming. All this has led to the present shortages in energy, seriously hampered the smooth progress of economic construction and caused inconvenience to the people's livelihood. In order to alleviate and eventually solve the difficulties in energy resources, intensified energy management, rational and conservative use of energy, and improved utilization rate along with an active increase in the investment for energy development and a forceful grasp of energy production have become urgent issues.

Energy conservation will inevitably involve improvement in technology, renewal and replacement of equipment, and reform of irrational structure in industry and products. The effectiveness of conservation will determine the growth of industrial production, the success of economic readjustment and the progress of the four-modernization construction. Comrades of the banking profession should all have a sound understanding of the energy problems and reinforce their initiativeness in supporting the conservation effort. They should have a sense of urgency and work to establish strategies for promoting long-term conservation.

Conservation Has Great Potential and Is Multifaceted

China is relatively backward in industrial technology and equipment and is not good at scientific management. Also, the cost of energy is on the low side and energy-consuming units often pay no attention to conservation and coordinated usage of energy. Accountability is ignored, energy consumption is high, thermal energy utilization is low, and losses and waste are ubiquitous. Based on rough estimates for the four municipalities of Shenyang, Anshan, Fushun and Benxi in Liaoning Province alone, the amount of combustible gas, low thermal value fuel, and production residual heat released and wasted every year is equivalent to some 6 million tons of standard coal, almost equal to the total thermal value of coal production of the nation's coal capital, Fushun Mining Bureau, in 1980. Last year, Laohutai mine at Fushun released 12 million cubic meters of mine shaft gas, which is enough to provide gas for 10,000 households for a year. The thermal efficiency of Fushun Power Plant is only 31 percent; the remainder of the heat is all carried away by the circulating water and released. If 20 percent of the released heat were recovered and utilized, it would be enough to heat 60,000 households for a year (assuming 50 square meters per residence) and the saving would be equivalent to 80,000 tons of raw coal. If the cast iron-coke ratio of Anshan Iron and Steel Mill were to reach the level of that at the Capital Steel Mill, 170,000 tons of coke would be saved every year. If the coke consumption per ton of steel were to reach the Japanese level, 2.38 million tons of standard coal would be saved in a year. The coal consumption for a ton of synthetic ammonia in Liaoning is 37 percent higher than that at more progressive provinces in

the nation, and the electricity consumption is 16 percent higher, which is equivalent to additional consumption of 200,000 tons of coal per year and additional electricity consumption of 77 million kilowatt-hours. In addition, waste caused by unsystematized equipment and "big horse pulling small wagon"; waste in electricity, coal and gas; leakage, drip and evaporation due to mismanagement; and waste in the transportation and production management stages are also very serious. It is clear that the potential for conservation is very great in Liaoning Province and the ways to conserve are many. All units that consume thermal energy in casting and forging and use furnaces and kilns, especially the metallurgical, chemical engineering, construction material, petroleum, coal mining and transportation departments, have residual heat, waste gas and chemical reaction heat for reuse. Therefore, intensified management of energy resources and rational conservation are effective means for solving the shortages in energy. The guiding concepts of increasing production speed through conservation should be firmly established.

Use Credits and Loans as Leverage in Promoting Energy Conservation

Banks are in the position and have the responsibility to exploit credit and loan leverage to actively promote and support the accelerated progress of energy conservation measures. In recent years, banks at various levels and a great number of credit and loan officers have increasingly recognized the far-reaching significance of conservation and have taken an encouraging step forward in promoting conservation and developing energy resources using credit and loan leverage and have achieved preliminary results. The People's Bank of Shenyang City innovatively accumulated capital and loaned out 1 million yuan to help Petroleum Plant No 1 in carrying out modifications of its east distilling and refinery facility. The modifications were completed in 1 month and improved the thermal efficiency and thermal recovery rate by 15 percent and 25 percent, respectively. This means savings of some 20,000 tons of oil and 90,000 kilowatt-hours of electricity per year. The People's Bank of Shenyang City also provided loans to enterprises in support of new energy-saving boilers, civilian electric meters urgently needed in conservation and production improvement, and provided conservation equipment for industrial technical reforms.

In some cases the utilization and potential development of residual heat and waste gas involve a number of departments or the entire community. Here the banks can also use their broad contacts, carry out the coordination, use economic influence, promote cooperation and do a good job of systematic utilization. Bank credits and loans can play a major role in executing the national energy plans. Banks should actively use initiative in support of conservation and energy development and grasp them well as high priority efforts at this time.

1. Support technical modifications centered around conservation.

The technical modification of existing enterprises centered around conservation is a long-term policy of China's modernization construction. The various economic planning departments have now come up with a number of conservation and energy development plans, generally pointing toward engineering projects combining thermal and electric energy. From the viewpoint of long-term effects,

these engineering projects make systematic use of thermal efficiency and are the proper way to make scientific use of energy resources in cities and towns. Compared with the single method of generating electricity, they have the advantage of not only increasing fuel efficiency but also of contributing to elimination of pollution and cleaning up the environment. Judging by today's needs, it is not unreasonable for the nation to support the rational development of some large-scale energy development or general energy utilization projects. However, in view of the large investments necessary for this type of construction (generally tens of millions of yuan), the complexity, high level of technology and long construction time needed for the engineering projects, and the associated problems such as resources, design, environmental protection, rational use of thermal energy and geology, the current credit and loan financial forces of the banks and the experience and technical level of the cadres are all incompatible with the work requirements. Therefore, for the time being, banks should be used mainly for the support of technical improvements centered around conservation.

For the same production volume, improvement, modification and development of potential, engineering projects generally save 50 percent of capital investment as compared with new construction projects; they also require shorter construction time and accomplish more for the same effort. Based on the principle of selective support for promising endeavors, we should give priority to those improvement and potential-development projects that require small investment, have rapid return and high economic efficiency, do not pollute the environment, and reduce the consumption of fuel. New construction projects that involve the general utilization of energy and the combination of thermal and electric energy should be left to investment by the government and planning and management by local governments. The focus for the people's banks in making loans should be energy conservation, at least for the next few years.

2. Insist on continuous decrease in energy consumption per unit of product and promote management improvement in enterprises.

This is an important avenue for boosting production, promoting readjustment and accelerating the four-modernization construction and is something every production enterprise should do. However, since energy resources constitute only a small fraction of the product cost, they often receive little attention. The banks should emphasize this point in making loans and exert their influence. This is a long-term strategy.

It has been estimated that the consumption of standard coal in China to produce 1 ton of steel, 1 kilowatt-hour of electricity and 1 ton of synthetic ammonia are respectively 1.6 tons, 453 grams and 2.7 tons. In Japan, the corresponding figures are 0.77 tons, 334 grams and 1.2 tons. In China the effective utilization rate of thermal energy is only about 30 percent, only half that of industrially developed nations. Obviously, reducing the energy consumption per unit of product is far more effective than increasing energy production in solving the inconsistency and conflict in energy supply and demand in China. One method is to use financial leverage--i.e., tight or loose credit, amount and duration of loan, and high or low interest--in promoting and supporting accelerated technical improvement and equipment updating in the existing enterprises, including the

production of new high-efficiency energy-conserving equipment and material. Medium- and short-term loans should be made systematically to help the enterprises in making planned improvements and to phase out high energy-consuming equipment. This should be done on the basis of going from easy, urgent and minor reforms to more difficult, less urgent and major reforms; from single machines to serial machines; and within the available financial and material capability. We should help the enterprises to strengthen their energy resource management, rationalize their coordination, balance their production, avoid idle operation, plug leakage and reduce loss and waste. The task of conserving energy is getting more and more difficult and elaborate. Personnel in charge of credits and loans should go right to the enterprises and shops to investigate and understand the situation thoroughly so that they can effectively help the enterprises improve energy resource management.

3. Insist on unified planning and overall balance in conjunction with promoting readjustment.

Energy conservation and development are among the central issues of the economic readjustment. All regions and departments should plan well to achieve a general balance in equipment, capital, resources, production and construction force under the guidance of the national plan. Banks should get involved in the regional economic readjustment, open up their credit and loan activity, and provide selective support on the basis of economy, rationality, necessity and practicality. Large and medium-scale projects should be given overall planning and should be evaluated by special design and technical departments, then approved by planning departments. In making minor reforms and modifications, consideration should also be given to overall balance, long-term effect, potential in resource and recovery, and the development prospects of related enterprises to prevent waste of capital and material. The tendency to blindly rush into a program should be overcome.

4. Insist on credit and loan principles and economic effectiveness.

Economic effects should be stressed in making loans, and the pulses and minuses of capital investment and economic return in making conservation loans should be weighed carefully to insure better return and timely payback of the principal and interest. There are times when the investment for a certain reform, improvement or potential-development program is substantial but the monetary return to the enterprise is not evident. For example, the technical modification of the chlorine gas delivery pipeline at the Shenyang Chemical Plant required an investment of 2.6 million yuan; after the modification, the annual saving of electricity would be 3.38 million kilowatt-hours for a value of only 194,000 yuan, and it would take 15 years to recover the investment. Using loan money at the current interest rate for medium- and short-term loans, 130,000 yuan of interest would have to be paid every year, while the enterprise could only recover a few hundred thousand yuan of the investment in a year. For this reason, some enterprises are not interested in getting loans to fund energy conservation programs. Some people say that energy conservation projects require a lot of effort and investment but the saving and return are small, and so they are uneconomical.

In view of the situation just described, the emphasis in bank loans should be for projects with greater return. Programs utilizing combustible gas and residual heat for public service should be carried out through government investment. The loan amount should be determined through a general assessment of the reform and improvement fund and the equipment overhaul fund; the shortage amount should then made up by a loan within the ability to pay back. In principle, the source for paying back the loan should be using the entire saving and profit of increased production to pay back the loan in its entirety after production begins. After the loan is paid back, profits should go into contract payment. If some enterprises would rather use the excess overhaul fund and modification fund in expanding their reproduction operation and use a certain percentage of the profit to pay back the loan, this should also be acceptable to the bank.

Since energy loans are a new practice in the beginning stage, continuously consolidated experience will be needed to gradually perfect the practice. Bank personnel in charge of loans should carefully and extensively study the engineering projects and exploit the financial leverage innovatively within the realm of the current credit and loan system. To provide adequate power for the development of four-modernization construction and for economic readjustment, we should act according to the principles of economics, rationally determine the direction of investment, and actively support the conservation and development of energy resources.

9698
CSO: 4006/328

Beijing Conservation Efforts

Beijing BEIJING RIBAO in Chinese 21 May 81 p 2

[Article by Hong Chuanzhen [3163 0278 2182]: "Municipal Government Holds Commendation Ceremony and Recognizes Conservation Achievers"]

[Text] The Beijing Municipal People's Government has held a citywide conservation commendation ceremony and recognized the outstanding achievements and contribution to conservation work in 1980 made by 42 progressive enterprises for conserving energy, 6 progressive units for conserving water, 10 progressive groups for conserving water, 474 progressive boiler rooms, 57 progressive motor teams, 236 progressive boiler operators and 119 progressive automobile drivers.

Among those addressing the meeting were Deputy Mayor Zhang Peng [1728 1756], representatives of conservation progressive enterprises, the municipal transportation company yard No 7, and the chemical plant, and representatives of progressive drivers and boiler operators.

In 1980, Beijing overfulfilled the conservation quota for coal, electricity, oil, and other fuels. As compared to 1979, the gross value of industrial production in the city increased by 9.7 percent, and the coal and electricity consumption per 10,000 yuan value of production decreased by 5.4 percent and 4.8 percent respectively. Increase in production and income through conservation was realized in 1980.

In his address to the meeting, Zhang Peng pointed out that the potential for conservation in Beijing is still great. Our industrial structure is basically oriented toward heavy industry and is energy intensive. The products, equipment, skill and technology of the enterprises are backward and the management work is incompatible. According to test results and statistics, the utilization rate of thermal energy is about 29 percent, and waste of energy resources is still prevalent. Leaders at various levels should further improve the understanding of the importance of energy work and step up the leadership. In supplying the energy resources, in addition to insuring an adequate supply for the political activities in the capital and the people's livelihood, a policy of selective support must be maintained in supplying resources for industrial production. Priority should be given to the needs of the light and textile industries, especially to products with good quality and market ability and economic in energy consumption. Energy needs for the production of well-known brand products and the 80 items for which increased production was recently affirmed at the municipal industry and transportation work conference should be insured. For energy-wasteful production, the supply of resources should be restricted or a deadline should be set for improvement. The three energy conservation directives of the State Council must be thoroughly carried out. The nation and the city have already decided to cut down on oil-burning units and facilities and to switch to burning coal. Electricity should be allocated in fixed amounts according to the permit; anyone who exceeds the allowed quota will be restricted in usage and the amount exceeding the allowance will be deducted and returned, but the amount saved belongs to the user. Consumers of electrical energy during the "valley" period will receive special treatment; those who use electricity at the "peak" period and exceed the allowed amount and those enterprises whose electrical consumption in 1982 fails to meet the national standard will receive a price increase. The consumption of automobile fuel and processed oils must be controlled and decreased. The recovery of lubrication oil should be insisted upon, and regarding the supply of coal, a price increase whould be imposed on those users who exceed the allowed consumption.

9698
CSO: 4006/352

Shanghai Metallurgical Bureau Conservation

Shanghai JIEFANG RIBAO in Chinese 23 Mar 81 p 1

[Article: "Encouraging Results Achieved by City's Metallurgical Bureau; By Strengthening Management, Lowering Unit Consumption, Remodeling Facilities, and Renovating Technologies, Energy Equivalent to More Than 265,000 Tons of Standard Coal Saved Last Year; Nearly 83 Percent of All Steel Rolling Heating Furnaces Achieved Oil Consumption of the Level of "First-Class Furnace" as Designated by the Ministry"]

[Text] The vast majority of the staffs and workers of the Shanghai Metallurgical Bureau have strived for increased production and development while conserving

energy. Last year the entire bureau was able to conserve various types of energy resources equivalent to 265,000 tons of standard coal, including more than 58,800 tons of fuel oil. During the months of January and February this year, compared with the same period last year, the entire bureau further conserved energy resources equivalent to more than 20,000 tons of standard coal, including more than 3,600 tons of fuel oil, and contributed significantly to easing the contradiction in the city's energy supply and demand and assuring the growth of the light and textile industries.

The metallurgical industry is a major energy-consuming enterprise, consuming more than four times the energy per unit of production consumed by the light and textile industries. Since the products of the metallurgical industry are basically things which are indispensable to the national economy, it is impractical to cut down on production in order to save energy so as to help develop the light and textile industries. Under such circumstances personnel in this industry have tried all means and methods to conserve energy. Since last year, they have implemented overall norm management on all energy resources, including oil, coal, coke, electricity, water, wind and steam, methane, oxygen, and compressed air. They have implemented management of the entire process of energy conservation of all departments, including all aspects such as planning, supply, facilities, and operation. From the plant headquarters to the factories and shops, energy management organizations have been established and everybody has been involved in the energy conservation management. Various measuring instruments have been installed and overall accounting of various forms of energy resource has been implemented. Energy conservation is practiced in all fields, including transportation, production and consumption. Significant results have been achieved through the strengthening of these management measures. Moreover, since the overall process of energy conservation management was implemented under the premise of guaranteeing the quality and quantity of products, the No 3 Steel Plant has operated its blast furnace only as much as necessary and has shut down the furnace as much as possible in order to conserve energy. The No 3 Rolling Mill used to operate three furnaces all the time. Since last year, this mill has strengthened planning and coordination and has steadfastly operated only two furnaces at a time. As a result, production there increased 13.5 percent over the previous year together with a 17.1-percent reduction in the oil consumption per ton of steel produced.

Remodeling facilities and renovating technologies have also had a significant impact on energy conservation. Altogether there are 29 oil-burning steel rolling heating furnaces belonging to this bureau. These furnaces used to consume 65 percent of the oil consumed by the entire bureau. Starting in 1979 a series of consolidated energy conservation technical measures was implemented, including modification and improvement of the furnace type, reduction of heat loss through the furnace wall, renovation of water pipes beneath the furnace floor, and increasing the volume and temperature of the hot air. As a result, per ton of steel, oil consumption decreased from an annual average of 61.69 kg to 52.94 kg last year, amounting to a drop of 14.2 percent. By this single item alone, more than 40,600 tons of oil were conserved last year. Today, the oil consumption standard of 24 out of the 29 oil-burning furnaces has already reached or surpassed the standard of "first-class furnace" as designated by the Ministry of Metallurgy, and no furnaces are classified as either "third-class furnace" or "outside class furnace" any more.

In addition, the bureau has further implemented norm undertaking and the principle of selecting the best to make arrangements on matters related to use of oil by the various enterprises in order to promote each plant carrying out its own energy conservation work. Each plant has tried all means and methods in order to bring down the unit consumption and to guarantee the economic effect and has achieved quite significant results in the conservation of energy.

9113
CSO: 4006/339

Wenjiang Nitrogen Fertilizer Plant Accomplishments

Chengdu SICHUAN RIBAO in Chinese 17 Mar 81 p 2

[Article by Zhang Shangqing [1728 1424 3237]: "Wenjiang Nitrogen Fertilizer Plant Overcomes Insufficient Natural Gas Supplies"]

[Text] Faced with sharp cutbacks in natural gas supplies in 1981, the Wenjiang Nitrogen Fertilizer Plant did not fight for energy resources with the administration but instead strived to increase production and profit by developing internal potential and conservation. The January-February synthetic ammonia and ammonium carbonate production target was completed 10 days ahead of schedule, and the average gas and electricity consumption per ton of ammonia and the total energy consumption per ton of ammonia were both lower than last year's level, putting the plant among the top rank of similar plants in Sichuan Province. The Wenjiang Nitrogen Fertilizer Plant is a red flag unit on the national small chemical fertilizer front and is a progressive enterprise in Sichuan Province and the local area. Last year this plant produced some 20,000 tons of synthetic ammonia, reduced its energy consumption and product cost, and overfulfilled the contract payment quota. In 1981 the volume of natural gas allocated by the administration has been cut back sharply and the supply is far below the level demanded by production needs. In the face of this situation, some comrades were deeply concerned and wanted to ask the administration for a larger allocation. However, after analyzing the situation, the plant leadership decided that they should not fight for energy resources which are in short supply but instead they should develop internal potential. They decided that they should not just have their own enterprise in mind but should also think about other plants. They explained this clearly to the staff and workers at a meeting of the staff and worker representatives and encouraged them to increase production, support the agriculture and contribute to the national cause even though the natural gas supplies were cut back sharply.

On the basis of this common understanding, the plant made production adjustments centered on improvement in the effective utilization rate of the energy resources and shut down one system and let a single system run at full power to carry out production. It also made efforts in the area of conservation and loss reduction, strengthened the management of energy resources and equipment, and improved the effective utilization of resources and the economic effect per unit of energy.

It distributed the energy resources to the main shift like rationing food, and demanded a certain volume of qualified products in return for the consumption of a certain amount of resource in order to achieve the maximum economic results. In the meantime, it worked out technical measures for conservation, recovered the gas released from the synthetic tower and increased the daily production of synthetic ammonia by 2.5 tons. The small amount of ammonia contained in the water of the carbonization recovery wash tower, which used to be discharged into a ditch, is now returned to the recovery tower and reused. In order to increase the economic efficiency of the energy resources, the plant also compared the economic return of producing ammonium carbonate and aqueous ammonia and adopted a plan to produce more ammonium carbonate and less aqueous ammonia. By using this scheme, it increased the ammonium carbonate production per cubic meter of natural gas from the level of 2.93 tons last year to 3.3 tons. The economic return per million kilocalories of thermal energy showed a net gain of 7.44 yuan, representing a 20.72-percent growth, and the consumption of gas and electricity have also been reduced greatly. For the first 50 days of 1981, the saving in gas and electricity amounted to 59,000 yuan in comparison with the requirement of the national plan.

9698
CSO: 4006/338

Hubei Hydropower Workers Conservation

Wuhan HUBEI RIBAO in Chinese 10 May 81 p 1

[Article by Lan Guozhang [5695 2654 7022]: "Province's Hydropower Workers Go All Out To Conserve Energy"]

[Text] Employees and workers of Hubei's electric power department--the biggest consumer of coal--have adopted a scheme of periodic analysis of the economic activity and selected the most efficient and economic measures in the drive to conserve coal. In the first 4 months of 1981, Hubei province overfulfilled the electricity generation quota by 240 million kilowatt-hours, while at the same time the coal consumption registered a savings of 6,700 tons and the power department's own electrical consumption was reduced by 34 million kilowatt-hours.

Hubei is short on coal resources, but its hydroelectric machine capacity is rather large. Hubei should generate as much hydroelectric power as possible, while the thermoelectric power generation should be properly controlled so that thermoelectric power is principally used in balancing and adjusting the supply of large electrical power networks. This is an important policy first adopted by Hubei. In 1980 and 1981, Hubei had abundant rainfall. The hydropower stations used the water sensibly and generated an extra 1 billion kilowatt-hours of electricity. Just this one item saved Hubei 500,000 tons of standard coal.

When thermoelectric power generation is used mainly for adjusting the imbalance between peak and valley power usage, the generator will start and stop frequently

and the coal consumption will certainly increase. Since the hydroelectric power is transmitted over long distances, the line loss increases accordingly. In order to conserve electricity used by the power industry itself and to cut down the line losses, the power plants set up a new award system for energy conservation. The operating crew at Songmuping power plant constantly carried out economic analyses, looked for causes and made timely adjustments to the operation. They consistently kept the facility in optimum condition and improved the thermal efficiency by 1 percent. Shashi thermoelectric power plant converted its water softening system into chemical salt-removing system and saved 5 tons of crude oil per day. Qingshan power plant also installed a comprehensive display system for continuous monitoring and control of the consumption and this had a significant effect on reducing the coal consumption. Before September 1980, the generation of 1 kilowatt-hour of electricity required 447 grams of coal, while now it is 443 grams. Just this one item alone saved 2,900 tons of standard coal for the province in 6 months.

9698
CSO: 4006/730

SHANXI PLANT ADAPTS TO CUSTOMERS' ENERGY NEEDS

Taiyuan SHANXI RIBAO in Chinese 4 Apr 81 p 2

[Article by Li Hai [2621 3189]: "Building an Energy Resource Base During the Readjustment; Shanxi Machinery Plant Manufacture More Winches and Coal-Loading Machines to Meet the Needs of its Customers"]

[Text] The Shanxi Machinery Plant has aggressively grasped ideological education during the readjustment and has guided its staffs and workers to pay close attention to the product market, to strive to improve product quality, to honor the contract, to establish a good reputation, and to guarantee services and thus has contributed anew to construction of the coal energy resource base.

At present, the Shanxi Machinery Plant serves its customers with the motto "fast, excellent, cheap and new," and is aggressively attracting customers and expanding its product market. By fast, it is meant to shorten the production cycle as much as possible and to deliver goods on time by honoring the contract. By excellent, it is meant to manufacture a high-quality product, to create a name-brand product which the customers can trust, and thus establish a sales base. By cheap, it is meant to reduce the production cost while increasing production in order to achieve a rational product price. By new, it is meant to understand the needs of market, to adapt itself to the circumstances, and to manufacture new products in a timely way so as to meet the needs of the customers. A few years ago, this plant stuck to a few "continuous system" products and did not want to change. As a result, imbalance between production and sales was created, with a stockpile of unsold goods. Starting this year, in addition to the traditionally "hot line products," the plant has designed and trial manufactured a kind of high-efficiency, low-cost coal-loading machine after careful research and thorough understanding of the urgent needs of the small mine operators. As soon as the model machine was built, orders rushed in from everywhere, including mines in the southeast and middle sections of Shanxi Province. One of the units from Gujiao area even placed an order with prepayment. This plant understands very well the customers' circumstances. Sales and technical personnel are dispatched regularly right to the sales bases, the mines, and to the production front beneath the well in order to understand what is needed on the production front and what facilities are favorable to the mining industry, so that timely readjustment may be made on its production line. For example, plant personnel learned that a 30-kW electric motor was too big for the 800 windlass in an area where there was a shortage of electricity, they immediately started to manufacture 22-kW electric motors, and their engineers

started to design smaller windlasses of 5-ton capacity. By doing so, they not only held onto an old sales base but also developed some new customers, and their path is growing ever wider. During the course of thoroughly implementing the readjustment plans, this plant also paid sufficient attention to educating its staff and workers in the concept of "quality first." They also organized customer service groups and called discussion meetings using informal come-as-you-are format and asked the customers' opinions, which were then passed on to the associate plants where technical tactics for launching an assault on the problem were formulated. In accordance with the needs of the customers, this plant has recently manufactured a new line of 11.4-kW winches. The customers are generally satisfied with the quality, performance, and the high production efficiency--a production of 7 tons of coal a minute. Each item of this product is snatched up by the customers before it is warehoused. So far, contracts to seel more tha 200 units of this winch have been signed.

In order to maintain steady growth in sales of its products, this plant has reassigned a dozen or so strongly business-minded and intensely motivated comrades to the sales staff in order to strengthen its ranks and so they can be dispatched to various places to promote sales of its products. So far, they have sold more than 120 units of the 800 windlasses, 25-kW winches, and coal-loading machines. Furthermore, based on teh concept of total responsibility to the customers, they undertake the maintenance of their own products, are responsible for supplying the repair parts and make house-calls to service their products. They also organize operator training courses to help familiarize their customers with their products and to become more proficient in operational skills, and have thus won the acclaim of many customers.

9113
CSO: 4006/339

COAL UTILIZATION DISCUSSED; SHANXI PRODUCTION VIEWED

Problem of Effective Utilization

Beijing MEITAN KEXUE JISHU [COAL SCIENCE AND TECHNOLOGY] in Chinese No 5, May 1981 pp 2-7

[Article by Wang Yinren [3076 1377 0086]: "Exploration of the Problems Concerning Rational and Effective Utilization of Coal Resources"]

[Text] The energy problem is an important strategic world problem. Rational development and effective utilization of various energy resources are the indispensable material foundations to realize modernization of the national economy. Coal, petroleum, and natural gas are common mineral energy resources; they are not only the main fuels and power for building up modern production, but they are also important industrial materials. At the beginning of the 1970's there was a crisis in petroleum, and since then many nations have placed their hopes on coal. Therefore, greatly developing and rationally utilizing coal resources have become an important part of the energy policies of many nations.

Our nation's reserve and production of coal resources rank third in the world. But compared to the world's industrially developed nations, our nation's efficiency of utilization of thermal energy is generally lower than the advanced levels of foreign nations because our nation's population is large and growing rapidly, industrial and agricultural development is rapid, while the business management of coal production is not perfect enough, and all this affects rational utilization. Now, these shortcomings have already visibly affected the national economic development and improvement of the needs of the people's livelihood. Therefore, various forceful measures must be taken to improve the structure and quality of products, and to strengthen the scientific management system for a rational and effective utilization of coal products in order to hasten the improvement of the techniques and efficiency of processing and utilization of coal, to study and develop new techniques and new technology for comprehensive utilization of coal chemistry to develop the economic value of coal to the greatest extent.

The development and construction of energy resources must be farsighted, because the construction cycle for developing energy resources is generally about 10 years. The energy resources needed 10 years from now must be studied, planned and arranged starting now. Scientific research in the rational development and

utilization of energy resources must take the lead in building up production according to the patterns of scientific development. For such efforts to become applicable requires advanced technology, and developing the productive forces to promote the economy requires a relatively long period.

I. Production and Utilization of Domestic Energy Resources and Coal

Although our nation's coal resources are rich and all varieties are present, mining regions need to be more profoundly surveyed and explored, geological information must be supplemented in order to understand the hydrological condition and the changes in the quality of coal and to solve complex problems in shipping by sea and by land, transportation and power transmission. Therefore, it is still difficult to develop and utilize this part of the resources.

During the 5 years from 1975 to 1979, our nation's total energy consumption was 2.614 billion tons of standard fuel, and the average annual consumption was 523 million tons, a gradual increase from 453 millions tons in 1975 to 586 million tons in 1979 (see Table)

问题探讨

煤炭资源合理与有效利用问题的探讨

汪 寅 人

能源问题是一个世界性的重大战略问题。合理开发和有效利用各种能源，是实现国民经济现代化必不可少的物质基础。煤炭、石油、天然气等常规矿物能源，不仅是近代生产建设中的主要燃料和动力，而且也是重要工业原料。七十年代初期，石油发生危机以来，不少国家把希望寄托到煤炭上。因此，大力开发和合理利用煤炭资源，已成为许多国家能源政策的重要组成部分。

我国煤炭资源的储量与产量，目前都居世界第三位。但与世界工业发达国家相比，因我国人口多而增长快，工农业发展迅速，而煤炭的生产经营管理不够完善，影响合理使用，热能利用效率普遍低于国外先进水平，现已到了显著影响国民经济发展和改善人民生活需求的程度。因此，必须采取各种有力措施，改进产品的结构和质量，加强合理和有效利用煤炭产品的科学管理制度，尽快提高煤炭的加工利用技术和效率，研究和发展煤炭化学综合利用新工艺和新技术，达到最大限度地发挥煤炭的经济效益。

对于能源的开发建设，必须从长远着眼，因开发能源的建设周期，一般是10年左右。10年以后需要的能源，从现在起就应着手研究、规划和安排。而合理开发和利用能源的科研工作，必须按科学发展规律走在生产建设之前，而变成能应用的先进技术和发展经济的生产力，就需要更长的周期

一、国内能源与煤炭的生产和使用情况

我国煤炭资源虽然丰富，品种也比较齐全，但在各地区的分布并不平衡。某些矿区还需加深勘探程度，补充地质资料，搞清水文和煤质变化情况，以及解决水陆交通、运输、送电等复杂问题。所以，目前开发和利用这部分资源仍较困难。

1975～1979年五年中，我国能源总消费量为26.14亿吨标准燃料，平均年消费量为5.23亿吨。从1975年的4.53亿吨逐年增长至1979年5.86亿吨（见表）。

1975～1979年国内能源消费构成表

年度	能源总消费量（亿吨标准燃料）	能源消费构成（%）			
		煤炭	石油	天然气	水电
1975	4.53	72.2	20.7	2.5	4.6
1976	4.76	70.3	22.6	2.8	4.3
1977	5.21	70.6	22.2	3.1	4.1
1978	5.78	69.9	23.5	3.2	3.4
1979	5.86	71.3	21.8	3.3	3.6

我国能源总消费量已达到世界第三位。但按我国9.7亿人口计，每人平均能源年消费量仅为600公斤标准燃料（其中平均每人年消费标准煤约420～430公斤），与美、苏等工业发达国家按人口平均计算的能源年消费量，相差十分悬殊。

建国30年来，我国煤炭产量增长了近20倍，而工农业总产值增长了14倍。到1979年煤炭产量增长速度已放慢。30年来，其它主要工业，如钢、铁、化肥、电力等工业生产增长速度与幅度均高于煤炭工业。钢产量增长约218倍，生铁产量增长约147倍，电力增长约65.[illegible]倍（包括部分烧油电站），化肥增长约1600倍（包括用石油与天然气作原料的部分

[Key on following page]

Key:

1. Year
2. Total energy consumption (100 million tons standard fuel)
3. Composition of energy consumption (%)
4. Coal
5. Petroleum
6. Natural gas
7. Hydroelectric power

The total energy consumption in our nation already ranks third in the world. But taking into account our nation's population of 970 million people, the per capita average energy consumption per year is only 600 jin of standard fuel (average per capita annual consumption of standard coal is 420-430 jin), and compared to the per capita average annual energy consumption of industrially developed nations such as the United States and the Soviet Union, the difference is very great.

Over the past 30 years since the founding of the nation, our nation's coal production has increased nearly 20 times, while the total production value of industry and agriculture has increased 14 times. In 1979, the rate of increase in the production of coal began to slow down. For 30 years, both the rate and scale of growth of other major industries, such as steel, iron, chemical fertilizers, electric power, were larger than that of the coal industry. Steel production grew about 218 times, pig iron production increased about 147 times, electric power increased about 65.6 times (including some fuel burning power stations), and chemical fertilizers increased about 1,690 times (including the part of the nitrogenous fertilizer industry that uses petroleum and natural gas as raw materials).

Our nation's efficiency of utilization of coal is relatively low, and the potential for conserving coal is very great. For example, the ratio of consumption of coke for smelting iron during 1975-1977 was 620-640 kilograms of coke for smelting each ton of iron (equivalent to the level at the beginning of the 1960's abroad), and in 1978-1979, the ratio of consumption of coke per ton of iron dropped to 550-560 kilograms, a conservation of 60-80 kilograms of coke per ton of iron (equivalent to 80-100 kilograms of washed coal). But compared to the level of the 1970's of industrially developed nations (the ratio dropped to below 500 kilograms), there is still a lot of potential which can be exploited, and the ratio of consumption of coke per ton of iron can be lowered further, by 50-60 kilograms. The ratio of consumption of coke for smelting iron in medium and small blast furnaces operated by localities in general is even higher, averaging 700-800 kilograms. Again, for example, the difference between the average consumption of coal at our nation's coal fueled power plants and the advanced levels abroad is still very large (about equivalent to the level of the 1960's). It dropped from 450 grams of standard coal per kilowatt in 1975 to 422 grams in 1979. Foreign advanced levels have already reached 300-350 grams of standard coal per kilowatt. Again, for example, the unit consumption of raw coal for the manufacture of synthetic ammonia using coke or anthracite in recent years has dropped from over 1,500 kilograms to 1,360 kilograms, higher than foreign nations by over 300 kilograms. Viewing the indicators of coal consumption by the three major industries described above, we can see that if rational and effective measures are taken, a large amount of coal can be conserved.

II. Development and Utilization of Energy Resources Abroad

The total consumption of energy abroad, according to incomplete statistics, increased from 2.45 billion tons of standard fuel in 1950 to 8.55 billion tons in 1978 (it is estimated that by 1980 this already reached 10 billion tons), an average annual increase of over 200 million tons of standard fuel. The consumption of coal dropped from 61 percent to 27.5 percent, and the consumption of crude oil and natural gas increased from 37.5 percent to 69.5 percent. Within the last 30 years, the amount of energy consumption increased on a large scale. In Japan, it increased about 9.6 times, in the Soviet Union, about 5 times, in West Germany nearly 3 times, in the United States about 2.2 times (in 1978 the consumption of standard fuel already reached 2.5 billion tons). According to 1979 statistics, the national per capita average annual consumption of energy in the United States was 11.32 tons of standard fuel. In the Soviet Union, West Germany, Britain, France, it was 4 to 6 tons of standard fuel, and in Japan it was 3.78 tons. The average per capita production of coal in the United States, the Soviet Union, Britain, West Germany is 3.5 to 2.0 tons in the Soviet Union, 1.9 tons in the United States, and 1.4 tons in Great Britain. The average per capita production of natural gas is as high as 2,430 cubic meters in the United States, 1,540 cubic meters in the Soviet Union. The per capita generation of electric power is over 10,000 kilowatt-hours in the United States, nearly 6,000 kilowatt-hours in West Germany, and 5,450 kilowatt-hours in Britain. The per capita average production of steel is 965 kilograms in Japan, 750 kilograms in West Germany, and 560 kilograms in the United States and the Soviet Union. The per capita national product in 1979 was $10,320 in West Germany, $9,550 in the United States, $8,830 in France, $8,680 in Japan, $5,580 in Britain, and $4,750 in the Soviet Union. The amount of coal consumption in the United States, the Soviet Union, West Germany constitutes 86.8 percent, 97.8 percent and 94.8 percent of the nation's yield, respectively (West Germany counts only hard coal and does not include brown coal). In the United States, Great Britain and France, 78 percent, 69 percent and 55 percent of the domestic coal is used for power generation, and in West Germany and the Soviet Union, 47.7 percent and 40.0 percent is used for power generation. In Japan, it is only 11.3 percent. The percentage of coal used by the coking industry is 76.7 percent in Japan, 41.4 percent in West Germany, 31.9 percent in France, 30 percent in the Soviet Union, 11 percent in the United States and over 13 percent in Great Britain. The percentage of civilian coal is the highest in the Soviet Union, constituting 16 percent of consumption; in Great Britain, 10 percent; in France, 6.6 percent; and in the United States and West Germany, only 1-2 percent.

III. The Major Problems Existing in the Development and Utilization of Coal Resources in Our Nation

Internationally, the "energy elastic coefficient" (i.e., the ratio between the annual rate of increase in energy consumption and the annual rate of increase in the total production value of industry and agriculture) is frequency used to study the relationship between energy consumption and the growth of the national economy of each nation. Under ordinary conditions, this coefficient should be about 1.0, i.e., the rate of growth of energy consumption and economic construction should be basically the same. According to statistical information on some major

industrially developed nations, during the beginning period of industrialization, the fuel industry developed relatively quickly to stimulate the rapid development of other industries. Limited by the level of science and technology of the time, the rate of increase in energy consumption has always been faster than the rate of increase in the total value of national production. The ratio between the two has frequently been greater than 1.0. From the beginning of the 1950's to the latter part of the mid-1970's, because of the rapid increase in the level of science and technology and the changes in the composition of energy and the national economic structure, the growth rate of energy consumption generally dropped. In industrially developed nations, the "energy elastic coefficient" has already dropped to 0.7-0.8, while that of developing nations is usually larger than 1.0 (it is 1.22-1.27 in our nation). When implementing our nation's energy policy mainly based on coal, studying the "elastic coefficient" of energy consumption must be considered on the basis of coal as the main factor. To assure the continued growth of our nation's national economy and to enable the "elastic coefficient" of energy consumption to drop from 1.22-1.27 to $\leqslant$ 1.0 are important questions that are worth overall study. What effective measures can be taken to solve this important problem? The first is to intensify the development and increased production of energy (mainly coal). The second is to change the structure of the national economy, adjust the ratio of ihe industries that consume a lot of energy and those that consume less energy (the ratio of heavy industry and light industry). The third is to greatly conserve energy, implement various effective technological reform measures, and increase the efficiency of utilization of thermal energy so that coal can be rationally and effectively utilized. Solving the shortage of supply and demand for energy must place conservation of energy (especially conservation of coal) in a position of priority within the near future. Considering the long range development, we must rationally develop and effectively utilize our nation's energy resources according to the "principles of equal emphasis on increasing production and conservation." It should also be pointed out that at present it is possible to conserve relatively large amounts of energy. But as the efficiency of utilization of energy increases, the rate of conservation will drop. Therefore, gradually developing the study and developing various kinds of new energy according to plan are also very important.

There is a lot of potential in the conservation of energy in our nation. This means that a lot of waste still exists in the use of energy. According to surveys and analysis of concerned aspects, about 35 percent of the waste is mainly due to the lack of a sound scientific management system within the enterprises. The remaining 65 percent of the waste is due to outdated and backward production techniques and technological facilities, irrational economic structure and inadequate planning. The main problems related to coal in energy consumption are the following:

1. Irrational structure of coal products, few varieties, and poor quality, affecting the efficiency of use

Among the world's major coal producing nations, our nation still produces, operates and manages raw coal. Because the coal producing departments "only care about production and do not care about use" and fail to conduct in-depth surveys and studies of the true needs of the users, therefore, the varieties of coal produced

are few, the quality is poor, and "they care only about completing the production task and not about the quality." Although in the bureaus and mines with a relatively large coal system there are a definite number and scale of separation plants and dressing and washing plants, and there are regulations concerning the ash content and the size and granularity for certain types of coal, these processed product types are few, frequently they are not fixed varieties, and they can hardly satisfy the demands for quality and variety of products by the various different industries.

2. Irrational production and utilization of types of coal

Of the raw coal produced in our nation, coal for coking constitutes over half of the production of coal of the entire nation. But the proportion of washing in recent years has constituted only 28 percent of the coking coal. The remaining 70 percent and more is used as ordinary fuel. This is a poor use of superior quality resources and a great waste. For example, the fat coal of Fangezhuang Mine of Kailuan and the coking coal of Shitai Mine in Huaibei are superior quality coking coal, but regrettably they can only be used for electric power generation and ordinary fuel because no washing plant has been built. If such irrational production and utilization are not corrected in time, a seriously unfavorable situation will result that will affect the necessary supply of superior quality coking coal for some large-scale joint steel and iron producing enterprises. Another phenomenon of wasting coking coal is that a relatively large quantity of metallurgical coke "is being used unsuitably and high-quality products are used for menial purposes."

One of the prerequisites of rational utilization of coal is "the consistency of supply and demand, the marketed products must be suited to the needs of the market." Otherwise, "the supply will not satisfy demand and products will not be suited for marketing." The coal will not be effectively utilized and this will cause wastefulness and loss. If raw coal is supplied to power plants with boilers burning pulverized coal, because of the relatively large quantity of lumps of coal and waste rock, sometimes this will cause the coal grinder of the power plant to fail to supply sufficient pulverized coal, thus affecting the efficiency of the boiler and reducing the capability of power generation. The coal fired boilers of ordinary power plants are all designed according to the characteristics of the quality of the coal, and the appropriate type of coal of corresponding quality must be supplied to assure a relatively high combustion efficiency of the boiler and output by the power station so that the coal is rationally and effectively utilized. For example, nitrogenous fertilizer plants generally require the use of lump anthracite as the raw material for manufacturing synthetic gas. But the percentage of lumps in the coal produced by our nation's major anthracite mines is relatively low, constituting only 15 percent of the total yield of anthracite throughout the nation. The percentage of lumpy anthracite produced by the Shanxi Jingcheng Bureau of Mines reaches over 55 percent, and there is still a potential to be exploited for increasing the production of lumpy anthracite (including the building of more separation plants, and the separate production of lump coal and pulverized coal). At present, anthracite is not fully screened and classified and rationally distributed, and many small chemical fertilizer plants make pulverized anthracite into lumps, increasing the cost of producing gas and

wasting coal. This is a conflict of the irrational use of coal. In designing enterprises that consume a lot of coal, frequently, too little consideration has been given to the study of the adaptability and the economy of the needed coal source (including the varieties of coal, demands for characteristics and quality). Thus, production cannot be carried out normally, causing serious wastefulness, loss and environmental pollution. The main reason is that the designers do not have an overall understanding and grasp of the technical and technological demands of rational utilization of coal and the basic nature of the coal producing regions of our nation.

3. Low efficiency of utilization of coal, high consumption, poor economic results of technology

Reportedly, the average rate of efficiency in the utilization of energy domestically is about 28 percent. The average efficiency in the utilization of the thermal energy of coal is about 20 percent. According to analysis, the consumption of energy of major enterprises using coal varies greatly. In 1979, the nation's most advanced small nitrogenous fertilizer plant consumed 1,845 kilograms of standard coal per ton of ammonia, while the average consumption of coal at the nation's small chemical fertilizer plants was as high as 3,730 kilograms of standard coal. The thermal efficiency of our nation's thermal power station averages 27-28 percent, while the advanced level of foreign nations reaches 35-38 percent. The highest thermal efficiency can reach 40-41 percent. If various effective techniques and management measures are taken, it is possible to lower the consumption of coal by the different systems of industries.

In our nation, there are also many regions that produce massive amounts of "indigenous coke" (estimated total production reaches 10 million tons). Compared to organic coal, the coke forming percentage is low, 15-20 percent, valuable chemical byproducts cannot be retrieved, and serious environmental pollution is caused. This is a big waste of coking coal resources. The annual consumption of civilian coal in our nation has already reached 150 million tons, and the efficiency of utilization of thermal energy is only 15-18 percent. The efficiency of ordinary coal fired industrial boilers is also relatively low, averaging about 55 percent. The result of direct burning of coal is a massive waste of thermal energy and pollution of the environment. If the techniques and technology of burning coal can be reformed, if the efficiency of utilization of thermal energy can be increased, a large amount of coal can be conserved. If the thermal efficiency of every 100 million tons of civilian coal can be increased by 3-5 percent on the present foundation of efficiency in the utilization of thermal energy, this would be equal to a conservation of 20-36 million tons of coal.

4. Coal for daily use is deficient, affecting improvement of livelihood and production; coal for production is inappropriate, affecting the increase in production value and efficiency

The ratio of the use of energy for living and for production in our nation is 1:4.5, while it is 1:2.3 in Japan, and 1:1.2 in the United States. In 1978, the percentage of fuel for civilian use was 17.8 percent, mainly coal used for living (not counting the supply of coal for local kilns and coal for self-consumption by plants). The average annual per capita consumption of coal was 211.5 kilograms.

The average annual per capita consumption of coal used for living by city residents was 730 kilograms. The average annual per capita consumption of coal used for living by farm village residents was only somewhat over 110 kilograms. The farm villages burn 500-600 million tons of stalks and grasses each year (equivalent to 250-300 million tons of standard coal). The availability of coal gas in our nation's cities is very low; there are only a little more than 12 million people throughout the nation who use gas, constituting only 1.3 percent of the nation's population (in Japan, it is over 76 percent), and about 7 percent of the urban population. Of the nation's more than 190 medium and larger cities, only one-third of the cities has partial availability of gas. Most of the city residents still use coal as direct fuel, seriously polluting the urban environment. According to foreign reports, the lowest average consumption of energy needed for living by the modern urban dweller is about 1.6 tons of standard coal per person per year--far from that of our nation.

In 1978, the energy consumption of our nation's industries was equivalent to about 400 million tons of standard coal. The major users were metallurgy and the chemical industry. The total energy consumption of the metallurgical industry was equivalent to 85 million tons of standard fuel, constituting 16 percent of the total consumption of the nation's energy (it consumed 11.7 percent of the nation's coal, 14.9 percent of the heavy oil, 24.1 percent of the power, 9.5 percent of the natural gas). The total energy consumption of the chemical industry was about 68 million tons of standard fuel, constituting 12 percent of the total national consumption of energy. Half was used for the production of chemical fertilizers, and synthetic ammonia alone consumed 29,350,000 tons of standard coal and 1,850,000 tons of heavy oil (not including natural gas and power). These two industries consumed 30 million tons of energy more than the nation's energy for civilian use and agriculture combined.

Since 1953, our nation's consumption of energy has increased about 10.5 times, while the total production value of industry and agriculture (according to stable prices of 1970) increased only about 6 times; thus energy consumption has increased more than economic growth. Therefore, the energy consumed for each 100 million yuan of production value has gradually increased from 50,000 tons to over 100,000 tons, and the production value created by each ton of energy has dropped from 1,850 yuan to 960 yuan, a drop of nearly one-half.

IV. Several Opinions Concerning the Rational and Effective Utilization of Our Nation's Coal Resources

1. Improve the structure of commercial coal, increase varieties, improve quality, satisfy the needs of departments using coal

At present, the structure of commercial coal of our nation is not sufficiently rational; although washed coal is classified into many grades according to the different ash contents, actually, there are only two types of coal for smelting and other uses. The washed coal for coking consumed domestically varies greatly in quality because of the difference in the variety of raw coal. A standardized norm (mainly by the content of ash) established for washed coal used for coking in the production of metallurgical coke to supply different types of coking furnaces and blast furnaces for coking and smelting iron often cannot satisfy

actual needs. The supply of coal used for smelting in large coking furnaces and blast furnaces should be superior washed coal for coking as much as possible (the ash content should be < 8-9 percent, the sulfur content should be < 0.5-0.7 percent. The ash content of washed coal for ordinary smelting should be increased appropriately to 9-12 percent, and the sulfur content should be ≤ 1.0 percent. The washed coal for other uses can be divided into several varieties according to higher ash content (including some weakly caking bituminous coal for power generation). Lump coal can also be divided into various varieties according to different grades of granularity and the different demands for variety and quality of coal by users. It can also be divided into various varieties of different quality according to the thermal value or the ash and sulfur content so that the products will satisfy the technical demands and standards for industrial coal, thus preventing inappropriate quality in the use of coal and a waste of energy.

2. Rationally adjust the prices of commercial coal, negotiate prices according to quality

At present, the price of coal in our nation is too low, only one-fourth to one-sixth the international market price of coal. The comparison of prices among different varieties of coal is not sufficiently rational. The difference in price of strongly caking bituminous coal and weakly caking bituminous coal is very small. If the comparative price of noncaking bituminous coal is 100, the weakly (medium) caking gas coal is 104, and the strongly caking fat coal is 110. The difference between 15th grade fat coal and gas coal of the same ash and sulfur content is only 0.6 yuan/ton. Comparative prices of the quality (calculated mainly according to the ash content at present) of coal is also not very rational. For example, for washed coal, regardless of the degree of difficulty of selection of washing the raw coal, for each increase or decrease of 0.5 percent in the ash content of washed coal, the price is adjusted by 1.5 percent. Generally, the selectivity of raw coal produced by most of the coal mines of our nation is relatively poor (medium difficult to difficult to select). After the ash content of washed coal has been washed to 10 percent, further lowering of the ash content in washed coal will reduce the retrieval of washed coal noticeably (each drop of 1 percent in the ash content means a reduction of 5 percent in retrieval rate; after the ash content drops to 7 percent, each further drop of 1 percent in ash content may produce a drop of 10 percent in the retrieval rate). The retrieval rate of dressing fat coal and coking coal in our nation drops more noticeably as the ash content drops. In practice, it is unfavorable to a correct evaluation of the variety and quality of coal and to fully developing the economic gain of rational utilization of coal resources if we do not base our judgment on the basic properties and the difficulty of selecting the various types of coal, if we do not take into consideration the classification of the granularity, the ash and sulfur content and the rationality and the economy of the rate of retrieval in dressing, and if we use a mechanical and uniform comparative price formula to establish the quality standards and the pricing policy for commercial coal. Therefore, to fully develop the active function of coal as the main energy, we must negotiate the price according to quality, and rationally adjust the prices of various types of commercial coal. Under set conditions, the mines and the plants can negotiate prices, sign contracts, supply coal at fixed points, and assure quality to enable both parties to actively develop production and conserve energy.

3. Suit measures to local circumstances, study and develop solid fuel of low thermal value, effectively utilize such fuel at the locality or nearby

The quality of raw coal produced in our nation is relatively poor. Each year, about 50-60 million tons of waste rocks are produced. A substantial amount of oil shale, carbonaceous shale and peat is produced. Such solid fuel of low thermal value should be effectively and comprehensively utilized locally and by nearby localities. Thus, the sources of thermal energy and power needed by the locality can be supplemented and they can also be used to fire bricks, tiles and lime, and even ash residue can be used to produce cement and light aggregate building materials. In mining regions, another effective way to develop energy and conserve coal is to appropriately process these solid fuels of low thermal value and to utilize boilers to burn them (or dry distillation) to produce steam and generate electric power (or retrieve dry distilled products). But long-distance transport must be avoided (for example, shipping 1 million tons of coal of low thermal value with an ash content of over 50 percent from the north to the south compared to shipping 1 million tons of raw coal with an ash content of about 20 percent is equivalent to additional consumption of over 5,000 tons of standard coal. Hunan and Zhejiang produce plenty of carbonaceous shale of low thermal value (stone coal). In mountain regions where transportation is inconvenient and where there is a serious lack of fuel, exploiting and comprehensively utilizing these fuels of low thermal value locally or nearby are measures worth the attention of the localities, which should implement corresponding rational measures in the development of local small industries, providing the thermal energy needed for processing industrial, agricultural and sideline products and satisfying part of the civilian fuel and power needs of the locality to gradually develop and perfect efforts to open up resources and conserve energy. It is also worth noting that some mountain regions have a rich reserve of combustible minerals such as oil shale and peat. The rational development and effective utilization of these energy resources of low thermal value require efforts to conduct surveys and research and to arrange scientific research of the resources as soon as possible.

4. In regions of relative deficiency of coal resources, the need for development and utilization of new energy is urgent

The provinces and cities of Liaoning in the northeast and Jiangsu, Zhejiang, Shanghai, Guangdong, Guangxi and Hubei in the eastern part of our nation are all regions that are relatively poor in mineral energy resources. At the same time, they are regions with relatively high industrial and agricultural production values. Because the conflict in energy supply and demand is more outstanding, the increase in the industrial and agricultural production value has been affected. For example, in 1978 and 1979, Shanghai lost 500-700 million yuan in production value per year because of a shortage of electric power and gas. According to statistics, at present, the nation has an annual shortage of about 40 billion kilowatt-hours of electricity, a loss of 70-80 billion yuan in production value (the total loss of the northeast and Shanghai is about 30 percent) and a loss of 17 billion yuan in profits. The main reason for the serious shortage in electricity is the shortage of coal. In the near future, to depend on coal to produce secondary energy sources and solve the conflict in electric power supply and demand is not an easy task that can be quickly realized. In order to solve the conflict in the supply and demand for secondary energy sources in the northeast, besides hastening

the construction of coal pits to increase coal production and conserve energy, we must also consider the development and utilization of new energy sources, mainly nuclear energy. If we build a nuclear power station of 1 million kW to replace a coal fired power station, although the investment in capital construction will be onefold more, after the plant begins operation, only 30 tons of nuclear fuel are required each year; this means a conservation of the capability and cost of transporting large quantities of coal, and the expenses incurred in the investment in capital construction can be made up year after year. If surplus heat from nuclear power stations can be further utilized and if the new technology of gasification of coal is developed, the efficiency of gasification of coal and the economic gain of nuclear power stations can be improved. It has become very urgent to actively study and develop the new energy centered around nuclear energy on the foundation of coal as the main energy source in the above mentioned regions.

5. Actively develop research in systems engineering to develop and utilize energy, technical economics and new technology in coal processing

At present, there are many irrational phenomena in the utilization of various kinds of energy in our nation. The main reasons are more or less a blindness and a lack of scientific foresight in the production and rational utilization of energy. Therefore, as quickly as possible we must develop the study of systems engineering in the development and utilization of energy, including forecasting and surveying mineral resources, the techniques of building pits, the technology of construction, the method of production, and the rational distribution of energy, distribution and transportation, composition of consumption, proportion of selection, quality standards, conversion technology and environmental protection measures, etc., as well as the study of new technical paths and economic gains of developing and utilizing other new energy sources (including nuclear energy, solar energy). For coal resources, new technology for processing and utilization of coal should be studied and developed as soon as possible, including conversion of coal into clean liquid fuel (gasification and liquefaction of coal) and elimination and reduction of the sources of pollution from coal (including harmful gases, elements and organic matter).

6. Actively develop the propaganda and popularization of science concerning the rational development and effective utilization of coal resources

At present, in the development and utilization of coal, there is insufficient understanding of the different varieties, basic properties and technological characteristics of production of coal. The differences and the scientific classification of the types of coal and the quality are not thoroughly understood. There have not been conscientious surveys and studies to learn how to reach the most rational and most effective use of the various types of coal produced by each province and even each mining region and how to produce the greatest economic results. This is also a cause of irrational production and utilization. To correct this, we must strengthen propaganda and popularization of the scientific and technical knowledge of rational and effective utilization of coal so that the production departments, management and users of coal can fully understand the original basic properties of the various types of coal, the technological

characteristics and the rational demands for quality in the technology of using coal to adapt to practical needs. Rational quality standards of the various types of coal for industrial use should be established. In this way, well co-ordinated supply and demand and rational distribution can be realized.

7. Hasten training of scientific, technical and managerial personnel, strengthen research and management of rational utilization of coal

For good rational utilization of coal, a lot of work must be done in the scientific management of production and utilization and technical reform to improve the efficiency of utilization of thermal energy. In addition, the development of new technology, such as producing gas from coal, producing oil from coal, mixed burning of coal and oil, joint cyclic power generation to prevent pollution produced by coal, environmental protection and the protection of people's health, and maintaining ecological balance all require a large amount of scientific, technical and managerial talent, and at present, the manpower engaged in these aspects is very deficient. We must begin now to grasp well the work of training personnel in a big way and develop intellectual resources. It is hoped that each department can actively take up the responsibility and quickly train a large number of people in specialized fields to contribute toward the rational utilization of coal and the rapid realization of the four modernizations.

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CSO: 4006/356

Views on Rational Utilization

Beijing MEITAN KEXUE JISHU [COAL SCIENCE AND TECHNOLOGY] in Chinese No 5, May 1981, pp 8-10

[Article by Chen Chengxia [7115 4453 1115] and Wang Duan [3769 4551]: "Views on Several Major Problems in the Rational Utilization of Coal"]

[Text] In the development of the national economy, energy is an important material foundation. Viewing our nation's energy composition, the proportion of coal will remain at about 70 percent from now till the end of this century. Coal is our nation's major energy source. According to an analysis of the present coal production, a difference between energy supply and demand will emerge around 1985. The need for coal will increase year by year, while the production of coal will not be able to achieve a large-scale increase within a short time because in construction of coal mines the scale is small, and a long, stable period is required. Therefore, demand will outpace supply. During the coming period, improving the efficiency of utilization of energy is the most important factor of the present energy policy. Rational utilization of coal to improve the efficiency of utilization is necessary so that each ton will function more effectively and thus the goal of conservation can be achieved. Increasing the efficiency of utilization of coal as viewed at present involves the following relatively practical aspects:

1. Study Rational Dressing, Selection and Processing of Coal, Increase Varieties, Improve Quality, and Supply Coal That Meets the Demands of Users

Since the founding of the nation, our nation's coal dressing industry has developed greatly. At present, most coal washing plants dress coking coal. The amount of raw coal for washing constitutes only 19 percent of the total yield of raw coal. The proportion of dressed coal is very low, and this has a serious effect on the rational utilization of coal.

Dressing, selecting and processing coal are important links in the rational utilization of coal. After dressing, waste rocks constituting about 15 percent of the amount of raw coal can be locally eliminated. Most of the troilite is no longer brought to the user, which greatly reduces the burden on the railroads and reduces the cost of shipping, and more importantly, less troilite prevents corrosion of the equipment and reduces pollution of the atmosphere. After selection, coal of different specifications and varieties can be chosen to satisfy the needs of various users and production techniques and to improve the efficiency of utilization. Besides the need to greatly enhance the dressing of coal for power generation, the development of the selection industry must be emphasized at present in order to increase commercial coal of various qualities and granularity specifications and to avoid the distribution of raw coal. Because the locomotive uses raw coal, a large amount of pulverized coal is carried away by smoke. It is understood that the amount of coal carried away constitutes 30 to 40 percent of the pulverized coal. Each year there is a loss of several million tons of coal. Therefore, using lump coal and small lumps of coal for combustion produces good results. The pulverized coal boilers of power plants require finely pulverized coal. If raw coal is supplied to the power plants, the consumption of electricity to grind the coal has to be increased, so the cost increases and a large amount of lump coal is wasted. Conversely, the needs of users for lump coal will not be satisfied. If the more than 100 million tons of coal used by the power plants and the more than 26 million tons of coal used by locomotives at present were all selected and processed to screen out lumps of coal larger than 13 millimeters or even small lumps of coal of 6-13 millimeters for use by locomotives and other coal burning equipment, then the loss of fuel coal could be greatly reduced and the effective utilization rate of coal by locomotives and other engines could be greatly improved. Therefore, dressing by washing and selection of coal are necessary as an industrial goal. But the extent of the processing of coal must be based on surveys and studies of the situation of our nation's coal resources, the quality of coal, the selectivity of coal, the technical requirements, the combustion equipment of the user, and technical and economic results, and it must be implemented in one region and one mining area at a time. The relationship between the effective utilization of coal resources and the dressing and washing of coal and the rate of retrieval of washed coal must be studied. To rationally utilize resources, the quality of coal must be evaluated on an overall basis in order to determine the most rational number of grades of coal. According to the results of utilization by the users and the supply capabilities, we must first satisfy the major users and distribute to users on the basis of major users first and then secondary users. To improve the results of utilization of coal, this work must be actively developed, and it is an aspect of work that has been effective.

II. Study and Improve the Various Combustion Techniques, Improve the Efficiency of Combustion

Improving the efficiency of utilization of coal is closely related to the equipment utilizing coal and the combustion technique. Improving the quality of coal can of course improve the efficiency of utilization, but it has its limitations. Improving the combustion technique is an important measure to improve the efficiency of utilization of coal on a large scale. Our nation produces 600 million tons of coal a year; nearly 100 million tons of coal are used as raw material and fuel for coking and synthesizing ammonia. Most is used as fuel. Burning by layer not only has a low thermal efficiency, but it also produces great waste. At present, the burning efficiency of pulverized boilers at power plants is relatively high. For example, the Tangshan Power Plant has been burning and dressing medium-grade coal for a long time, and the thermal efficiency reaches 80-90 percent. Coal used by the ordinary layer combustion furnace has a high ash content, granularity is small, resistance is high, and air does not easily come into full contact with the combustible organic matter. The coefficient of surplus air is large, the thermal efficiency is low, and in particular, certain vertical boilers and small civilian stoves burn bituminous coal with a high volatile fraction. The coal burns at the bottom and undergoes dry distillation and thermal decomposition at the top, emitting large amounts of volatile substances and coal tar. These products that have not fully burned are exhausted from the smokestack. The fuel has not been fully utilized and this causes serious environmental pollution. Therefore, studies to improve combustion techniques, especially studies to improve the presently available medium-size and small boilers and civilian stoves are very significant for conserving coal and improving efficiency. Take coal for civilian use as an example: studying top-lit honeycomb coal and the structure of the stove or gradually expanding the supply of anthracite of low-volatile fraction and low sulfur and semicoke so that thermally decomposed products burn fully can improve thermal efficiency, and compared to the thermal efficiency of 15-20 percent (calculated on the basis of a gasification of 60-70 percent, a combustion efficiency of 55-60 percent of coal gas), and is more beneficial to environmental protection. But the investment in capital construction needed to develop urban gas is large, and in our nation's present technical and economic conditions, it is very difficult to rapidly develop urban gas within a short time. Up to now gas in our nation is available to only 15 percent of the urban population. The use of coal as the main source to produce gas fuel will not increase in the short term.

According to our nation's actual situation, suiting measures to local circumstances is a more practical energy conservation measure at this time. The first consideration should be how we can concentrate a definite force to study the various combustion techniques and improve the efficiency of combustion. Although definite progress is being made in this regard, the force is relatively weak, there is insufficient emphasis, and it is far from satisfying the demands of the present development in production. While studying and considering major long-range technical problems that have the possibility of being solved within a short time. We must start out from our nation's actual situation so that new techniques for rational utilization of coal can be found continuously.

III. Develop Enterprises of Comprehensive Utilization Centered Around Coking, Produce Coke for Various Uses, Retrieve Coal Gas for Synthesis and for Civilian Use

Our nation is rich in coking coal resources and the proportion for exploitation is large; the yield of coking coal, gas coal, fat coke, and black jack constitutes about 48 percent of the nation's yield of coal. But the amount of coal washed constitutes only one-fourth of the raw coal for coking. Large amounts of coking coal cannot be rationally utilized. It is characteristic of our nation's coking coal that the proportion of gas coal is larger and the rate of rejection is high. On the basis of this characteristic, in order to rationally utilize these coking coal resources, it is necessery to further develop many methods of comprehensive utilization centered around coking; to produce coke for various uses, including metallurgical coke, chemical industry coke, and coke for civilian use; and to retrieve various chemical products and large amounts of coal gas for use by the chemical industry in synthesis, for civilian use, and for use as industrial fuel.

Our nation's coking industry developed rather quickly during the 1950's and 1960's. At present, the production capacity of mechanized coking furnaces already reaches over 30 million tons, but they mainly produce superior quality metallurgical coke. Because of the singularity of the variety, a large amount of superior quality metallurgical coke had to be used by the non-smelting industries, lowering the results of utilization. The amount of metallurgical coke produced each year is not small, but the metallurgical departments still experience a shortage in the supply of coke. At present, some departments still have to expend a lot of effort to study the use of weakly caking coal and noncaking coal to produce formed coke that does not have a high quality. This has caused a big waste of energy and power. At present, the degree of comprehensive utilization of coke products and coking furnace coal gas is poor. During the beginning period of the 1960's, plans to establish some joint bases of metallurgy-coking-chemical engineering were drawn up many times, but up to now none has been built. Our nation still produces large amounts of indigenous coke: over 10 million tons are produced each year. This type of indigenous coke has a coke forming percentage of only about 60 percent, and the ash content of the coke is generally higher than 20 percent. Nearly 50 percent of the organic combustible substances in raw coal are burned away: this is a big waste of energy and it seriously pollutes the environment.

To more effectively utilize coal resources rationally and conserve energy, our nation has already prepared a definite scientific and technical and industrial foundation. Indigenous coke furnaces should be gradually phased out, and small coking furnaces should also gradually undergo technical improvement. On the basis of the distribution of coal resources in our nation and technical conditions, developing urban gas is a possible direction; from the standpoint of the application of gasification furnaces in industry, only the Lurgi process of furnace gasification technique is sufficiently mature at present, but the Lurgi furnace requires lumpy brown coal and noncaking or weakly caking coal as raw coal, with a granularity of 6 to 50 millimeters. Resources of this type are very unevenly distributed in our nation; they are located mainly in Neimengol, and in the northwestern, northeastern and southwestern border regions, while reserves of this

type of coal near the large cities are small. Only cheap brown coal should be used to produce urban coal gas of medium thermal value because it is economically more rational. This point needs to be considered. Because of the actural situation in our nation, besides developing the Lurgi furnace gasification technique in places where conditions are favorable, gas coal with a stronger caking property should be used more as raw material, by suiting measures to local circumstances; technically mature coking furnaces or vertical continuous coalification furnaces should be developed, producing coke and coal gas at the same time. Practice shows that the least expensive way to produce coal gas is in coking furnaces, so developing coking is an effective way to comprehensively utilize coal at present.

IV. Improve the Presently Available Gasification Techniques, Study New Techniques of Coal Gasification

In industrial production, the main use of coal is to serve as fuel for boilers and kiln furnaces. But for some industrial kiln furnaces, such as the open hearth furnace for steel making and the glass pool kiln and some other heating furnaces, only gaseous fuels can be used. Some industrial kilns can use coal directly as fuel, but the thermal efficiency is low, control is difficult, and the various technical demands are not easily satisfied, so product quality is affected and the environment is polluted. Industries within modern city limits abroad almost entirely use gaseous fuels.

The techniques of gasification of solid fuels which are technologically mature have already entered the commercial stage. Based on the different methods of contact between the gasifying agent (air, oxygen, steam) and coal, they can generally be divided into three major categories: the stationary bed, the fluidized bed and the air flow bed. Each gasification method requires a distinct quality of coal. The stationary bed coal gas generating furnace used both abroad and domestically requires a high quality of solid raw coal. For example, the granularity, moisture content, ash content, volatile content, sulfur content, slag forming, ash melting point, caking property, thermal stability, mechanical strength, and chemical activity all directly affect the normal operation, intensity of gasification, and technical and economic results of the gasification furnace. The stationary bed coal gas generating furnace has already developed into an important part of our nation's industrial energy. According to incomplete statistics, there are nearly 100 coal gas generating stations in our metallurgical machinery, building materials, chemical industry, and light industry departments. Some 500 units of fuel coal gas generating furnaces have been installed. It is estimated that they consume 4 million tons of coal each year and they have served greatly in industrial production. In the past, the shortage in the supply of lump coal and coke affected the development of this type of gasification furnace, and so some gasification furnaces were converted to burning oil. Now, because of the shortage of petroleum resources, the use of coal gas has begun to develop again. Therefore it is necessary to study the K-T furnace and the slag smelting furnace and such new pulverized coal gas production techniques in a big way and to expand coal resources for gasification and improve the efficiency of gasification. In view of the actual technical conditions of our nation at present and because the K-T furnace pulverized coal gas production requires a lot of oxygen, the investment and cost are high, so the gasification technique still requires further improvement. Therefore, the

function of the various types of stationary coal gas generating furnaces presently available still needs further development. The problem is how to study and expand the resources of large lumpy coal and coke for gasification, how to carry out technical reform of the presently available gasification equipment, how to improve the level of automation, and how to handle the three wastes so that the presently available stationary bed coal gas production technique can be revived to realize further development.

In summary, we realize that rational utilization of coal, improving the efficiency of utilization of coal, and energy conservation are broad questions and there is a lot of work to be done, but in order to invest less, to produce quick results, and to be practical, we must start out from the characteristics of our nation's coal resources, from the presently available technical conditions and material foundations; long-range research work must be carried out, practical problems must be solved, and efforts that can change the present situation should be given sufficient emphasis.

9296
CSO: 4006/356

Role of Shanxi Production

Beijing DILI ZHISHI [Geographical Knowledge] in Chinese No 3, 1981 pp 2-3

[Article by Cao Wenlong [2580 2429 7893]: "The Home of Coal--Shanxi Province"]

[Text] From the "Geological Distribution Map of Shanxi Province," one can see that Shanxi is indeed a world of coal, or a sea of coal. Rich coal resources can be found from east to west, from north to south. No wonder Shanxi has long been known as the "home of coal."

Shanxi's immense coal reserves are distributed from the source of the Sanggan River on the plateau beyond the Great Wall to the vast expanse of fertile land along the banks of the Fen River, and from the towering Taihang Mountains to the verdant Luliang Mountains. Its proven coal deposits are up to 200 billion tons, and the predicted coal deposits are over 800 billion tons. Shanxi is the richest coal province today. It not only ranks first in coal reserves, but its coal deposits are also scattered over a vast territory. Within the entire province's 156,000 square kilometers of land, there are 58,000 square kilometers of coal reserves, accounting for 37.2 percent of the province's total area; and 94 of the 105 cities and counties in the province have coal resources.

Shanxi coal has quite a few excellent features: first, there is a wide variety of coal, e.g., coking coal, power coal, and anthracite, which account for about half of these categories of coal deposits throughout the whole country. There is also a whole range of coking coal, i.e., primary coking coal, lean coal, fat coal, gas coal and other high-grade varieties. Besides, lignite is used in many ways and is one of the chief raw materials of the chemical industry. Second, the coal is

of high quality. The majority of the Shanxi coal is of low ash content, low sulfur content, and high calorific capacity, and it is thus suitable for both industrial and civilian uses. Lanha coal, which is produce in Jin County, known both at home and abroad for its clean, high combustible and high calorific qualities. In the past it was used to light the fireplaces of imperial palaces in some West European countries. Third, the geological structure is rather simple. In general, the coal seams are fairly shallow and gently inclined with only a few heaving sand layers and faults, which makes it possible to construct mines at high speed and exploit the resources at low cost. The time generally required for constructing a medium-size pit in a geologically complicated region is sufficient to build a large mine shaft in Shanxi.

Classified according to the characteristics of the geological structures, there are eight major coalfields in Shanxi, i.e., the Xinshui, Xishan, Huoxi, Hedong, Datong, Ningwu, Wutai and Hunyuan coalfields. The Xinshui coalfield is located in the southeastern and central parts of Shanxi, and a large portion of Linfen District as well. The Taihang Mountains run along the eastern and southern sides of the coalfield, while the Huo and Hutai mountains lie to the west and north respectively. It is called Xinshui Depression based on geological structure. Both the Xishan and Huoxi coalfields are situated in synclinal structures. The coalfield west of the Luliang Mountains is located along the border of the Shanxi-Gansu-Ningxia (or Ordos) Basin, and because of its location west of the Yellow River, it is known as the Hedong [River East] coalfield. The Datong coalfield and the Ningwu coalfield are located in the geological structures of the Datong and Ningwu sedimentary basins, extending in an east-northeast direction. The slopes of the strata along the edges of the basins are fairly steep, but the strata in the central portions are gently inclined. The Wutai and Huoyuan coalfields are also situated in intermontane synclines. These geological structures help to preserve the coal seams.

Each of the eight major coalfields in Shanxi has its own unique feature. The Xinshui coalfield covers an area of nearly 30,000 square kilometers; it is the largest of Shanxi's eight major coalfields and one of the major coalfields in the world. The Hedong coalfield ranks second in size, covering approximately 17,000 square kilometers, but in terms of exploitation and utilization, it is still no match for the other coalfields. Next in line are the Huoxi, Datong, Ningwu, and Xishan coalfields. Although the Wutai and Hunyuan coalfields are smaller in size, they are regarded as a pair of precious 'black stones' by the residents in the mountain area as well as by the developers of local industries.

Long History of Exploitation

The history of coal exploitation in Shanxi goes back a very long way. It is said that "Nuwoshi" melted stone to repair the sky, and left the remains of the stone of Fu Mountain in the eastern part of Pingding County in Shanxi. According to "The Coal Geology of Shanxi," the Shanxi people began to dig out coal by hand 2,000 years ago, in the Han Dynasty. In a book entitled "Pilgrimage to Tang In Quest of the Law," it is written: "Exit from the western gate of Taiyuan Prefecture...travel west for 3 or 4 li to a mountain called Jinshan (note: now known as Xishan); there is a stone coal all over the mountain, and people come here from near and far to gather it as fuel for cooking. It is extremely flammable, and remain as tone coked into coal. So it is said that the fire [stones] from heaven can be burned." By the Song Dynasty, coal mining thrived and flourished.

In "The Outline for Construction of the Country." Mr Sun Zhongshan [Sun Yat-sen] proposed the following guidelines for industrial planning: "Shanxi's inexhaustable resources of coal and iron should be exploited extensively." However, it was not until the whole country was liberated that Shanxi's coal exploitation really got underway and became one of the major projects of the country. In 1949, the raw coal output of the whole province was only 2.6 million tons. During the period of the first 5-year plan, the newly enhanced productive capacity of Shanxi's coal industry accounted for 15.7 percent of the coal production of the entire country. It became 10.5 percent during the period of the second 5-year plan, 9.4 percent during the 3-year adjustment period, 9 percent during the third 5-year plan, and 11.3 percent from 1971 to 1977. It took more than 30 years of construction to set up a large-scale coal mining network. Today, the province already has 13 state controlled coal mines, such as Datong, Yangquan, Xishan, etc, and 182 local coal mines run by the provinces, district (municipality) or county (prefecture), as well as more than 2,000 small coal pits run by the commune or brigade. Last year, the raw coal output of the entire province topped 100 million tons, which was approximately one-sixth of the whole country's raw coal output, ranking first among all the provinces, cities and autonomous regions throughout the country. Moreover, Shanxi accounts for more than 50 percent of the coal output provided to the state by the various provinces, cities and autonomous regions, and Shanxi coal also accounts for more than half of the nation's coal for export. Shanxi also provides the country with more than 70 percent of the profits gained from the coal industry throughout the whole country. Shanxi not only produces enough coal to meet the needs of its own industrial and agricultural production as well as its inhabitants, it also supplies coal to more than 20 other provinces, cities and autonomous regions throughout the country. At present, coal is the top energy source of our country, and Shanxi is one of the strong supporting pillars of the nation's energy sources structure.

A Preliminary Energy Base

The impetus of the coal industry has helped to bring about the rapid development of Shanxi's electric power, coal chemical industry, metallurgy, machine building and light industry. To enable Shanxi's coal industry to contribute much more to the nation's four modernizations program, it was proposed at the Fifth People's Congress of Shanxi Province last December to build Shanxi into a strong energy base serving the entire country. To achieve this end as quickly as possible, with the support of the state, operations have already begun to construct a huge coking coal base in the Gujiao mining district with a projected capacity of 16.5 million tons, in the Guishigou mining district in Yangquan with a capacity of 4 million tons, and at the Yanzishan coal mine in Datong with a projected capacity of 4 million tons. The Ping(lu)-Shuo (Xian) open pit coal mine will be developed as a joint venture project with the United States. Also, in such large-size mine-site power stations as the Shentou power plant, Datong power plant No 2 and Niangziguan power plant, some generating units have already become operational. Shanxi will also begin to build a large chemical fertilizer plant with imported equipment. These magnificient engineering projects will add strength to the Shanxi energy base.

The rapid development of Shanxi's coal industry will open up bright prospects for the Shanxi energy base. With the growth of the coal industry, Shanxi is vigorously developing mine-site power stations which will transmit strong electric current to Northern, Central and Eastern China. Shanxi will also energetically develop a coal chemical industry which will utilize the coal resources to make synthetic fibers, synthetic plastics and synthetic rubber, and change the structure of the industrial raw materials in Shanxi. Moreover, Shanxi is also capable of developing nonferrous metal industries which are heavy energy consumers, and it can make maximum use of its rich resources of aluminum, copper and iron, thus reversing the backward state of Shanxi's nonferrous metal industry.

With the changes in energy sources structure and the development of science and technology, the utilization of coal will become much more extensive. By then, Shanxi should be able to contribute a great variety of coal products to the nation's four modernizations. Shanxi will be a powerful energy base that will rank among the largest coal energy bases in the world, such as the Appalachians of the United States, the Dunbas of the Soviet Union, and the Rhur of West Germany.

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CSO: 4006/308

Shanxi Work Conference on Coal

Taiyuan SHANXI RIBAO in Chinese 10 Apr 81 pp 1, 2

[Article by SHANXI RIBAO correspondent: "Greater Coal Extraction for the Four Modernizations"]

> [Text] The Shanxi provincial work conference on coal urged all coal mine workers to enhance their glorious tradition of fighting spirit, to make courageous contributions to stabilizing the national coal production at 600 million tons per year, to reaching the 110-million-ton coal production goal called for by the government, and to speeding up the pace of readjustment and mine shaft construction.

It was determined at the Shanxi work conference on coal that all coal mine workers in Shanxi should be organized and mobilized to enhance the glorious tradition of their characteristic fighting spirit in order to insure that the national coal production level is stabilized at 600 million tons per year. The workers were urged to keep the national situation in mind, assume heavy responsibilities and contribute their effort to accomplish the 110.44-million-ton coal production mission assigned to Shanxi by the government. They were also called upon to speed up the pace of readjustment, increase the rate of new mine construction, strive to boost income and cut spending, and accumulate and conserve more capital for the nation.

The Shanxi work conference on coal production was held from 26 March through 3 April in Taiyuan. It was attended by 350 officials, engineers, technical personnel and professional cadres of various provincial and local state-operated coal mines. All the comrades attending the conference agreed that the conference was a success and that it was held at just the right time. The aim of the conference was to learn further how to carry out the spirit of the central work conference. By consolidating the experience, analyzing the situation, communicating with each other and deciding what measures to take, the conference put the tasks of speeding up the pace of readjustment and new mine construction proposed at the national work conference on coal production on a solid basis. It was also a conference that raised the spirit, strengthened the confidence and promoted the objective of making Shanxi a strong coal energy base as soon as possible.

During the conference, comrades in charge of the Shanxi CCP Committee and the provincial people's government attended and addressed the conference.

The conference advanced the belief that whether the mission is to accomplish the current coal production goal as assigned or exceed the requirement or to accelerate the construction of the coal energy base, one must have a vision of the overall picture and view the local situation accordingly. There should be a clear understanding of the role and function of Shanxi's coal in the national energy production. Last year Shanxi's coal production amounted to one-fifth of the national total, and more than 73 million tons of coal were transferred out of Shanxi, that is, more than half of the inter-provincial coal transfer in the entire nation. At present, some 200,000 tons of coal are transferred out of Shanxi every day. This has an important role and function in supporting the energy demands of more than 20 provinces and municipalities. In order to stabilize the national coal production at the 600-million-ton level, the coal production assignment given to Shanxi for this year is larger than that planned last year. Moreover, the readjustment and new mine construction assignments are also heavier than predict anticipated, but all these assignments are required by the overall situation and their accomplishment is necessary. As for the conditions to accomplish the mission, the discussion and analysis at the conference led to the unanimous opinion that the favorable conditions and supportive factors are many and that they predominate. Unfavorable conditions and difficulties along the way do exist, but they can be changed with enough effort and the practical difficulties can be overcome. Especially important are the support, guidance and coordination provided to the production construction of the Shanxi coal industry by the central government and various departments in the province. Even though the national financial situation has encountered difficulties and the capital construction investment has been cut substantially, the capital construction investment allocated to the state-operated coal mines in Shanxi for this year is still some 22 million yuan more than that of last year. Equally strong national support is also given to production equipment, technical guidance and other areas. Various branches and departments within the province also provide their services in the manufacture and maintenance of mine equipment and in the improvement of transportation conditions and supply of commercial goods in order to actively support the production and readjustment of the coal mines and to help build a coal energy base.

The conference members also expressed the belief that after a long-term effort, Shanxi has formed a coal industry structure that combines large, medium and small

operations. The state-operated large mining bureaus produce more than half of Shanxi's total coal production and they are the backbone of this industrial structure. The proper policy of combining the large, the medium and the small must be insisted upon if we are to insure the fulfillment of the national goal of upgrading the coal industry and accelerate the progress of building an energy base. We should not only advocate that the small mines respect the large mines, not compete for resources with the large mines and not cause problems to the large mines, but we should also advocate unified planning and regulation by the large mines so that the large mines help the small ones. Mines of various sizes should all have their readjustment period; all mine workers must grasp the main points from a pragmatic viewpoint. The local communes and teams should pay special attention to strengthening their safety procedures, improving their mining methods, raising their disaster-resistance ability and resource recovery rate, and protecting the workers' safety and the national resources. All coal mines in the province should insist on the "safety first" policy and establish a rigorous responsibility system for safe production. Safety regulations should be carried out conscientiously and safety measure engineering projects should be given high priority and completed first. Great efforts should be made to improve safe production in preparation for the national coal mine safety recognition conference to be held in Shanxi.

It was unequivocally pointed out at the conference that the basis for making a greater contribution and for accomplishing this year's coal production and construction assignments on schedule and ahead of schedule lies in the firm stance on the four fundamental principles and the directions and policies of the Third Plenary Session of the Party Central Committee. It also lies in strengthening the political thinking, the leadership and the working staff. We should maintain the system whereby bureau and mine directors are responsible to the leadership of the party committee and fully exploit the efforts of party organizations of various levels and party members serving as the central and leading examples in production and construction. Engineering and technical personnel should develop their function to the fullest extent and make great efforts to strengthen scientific research and full staff training. Competition in style and contribution should be advocated; being on the front line in the mine shaft, finishing all the assignments and not missing any work should be recognized. We should be proud to learn culture, science, technology and management. We should be proud to follow orders, obey rules, to be civilized and to have good manners. The comrades participating in the conference looked back on history and talked freely about their accomplishments. They are vivid evidence of the fact that Shanxi coal mine workers are a team who love the party, socialism, and their posts. They are also a team with a lot of practical experience and are able to endure great hardship, a reliable team that are not afraid of difficulties, that are courageous, and that have a vision of the overall picture. These are reliable insurance for constantly creating new results and accomplishing new victories in our progress ahead.

9698
CSO: 4006/285

Energy Base in Shanxi

Taiyuan SHANXI RIBAO in Chinese 10 Apr 81 pp 1, 2

[Editorial: "Making Shanxi a Strong Energy Base"]

[Text] In the relationship between the local situation and the overall situation, the overall situation dominates and the local situation is a part of the entirety and should serve the overall situation. Any department or region and any task in the revolution are parts of the whole. To truly understand the role of the local situation and to make it function properly, one must view the role and function of the local situation as part of the overall situation and understand the relationship among various local situations. Lenin quoted Hegel in his "Philosophical Notes": "The various parts of a body are what they are only when interconnected. A hand without the body is only a hand in name." This vividly illustrates the inseparable nature of the parts and the whole. The parts can function fully only in serving the whole.

The advantages of Shanxi Province are that we have a rich reserve of coal and we contribute a large production of high quality coal of all varieties. In order to further exploit these advantages, we must consciously view the local situation from the standpoint of the national situation. The nation has assigned Shanxi the mission of producing 110.44 million tons of coal in 1981, 6.19 percent more than under the 1980 production plan. In the meantime, we are required to accelerate the pace of readjustment in the coal mines and the rate of constructing new mines. We must carry out the honorable and difficult tasks of completing a large number of engineering projects on safety measures, on improving the linkage ability, and on new mine construction. We also need to accumulate and conserve capital for the nation wherever possible. All these tasks are aimed at stabilizing the national coal production at the 600-million-ton level and to insure a daily transfer of 200,000 tons of coal out of the province to support the energy needs of the nation. These tasks are necessary for the further readjustment of the economy and further political stability--in other words, for the needs of the overall situation. Essentially, to exploit the local advantages from the viewpoint of national needs is to act objectively and to wield the superiority of the socialism system.

In making use of the local advantages for the national cause, in accelerating the pace of readjustment and mine construction, and in completing and exceeding the coal production assignment for 1981, the most important thing is to conscientiously and thoroughly carry out the spirit of the Central Work Conference and, under the guidance of the policies of the Third Plenary Session of the Party Central Committee, to mobilize and organize the vast ranks of coal mine workers and to develop the honorable tradition of a special fighting spirit. The spirit of being unafraid of hard and tedious work, of being proud to be a coal mine worker contributing to the four modernizations should be highly publicized. We should also publicize the spirit of obeying discipline, following orders, not missing any work and completing all the assignments. Be proud to learn culture, science, technology and management. And be proud to be civilized and good mannered. Based on the special circumstances of the coal mines, combine the tasks of solving thinking problems with those of solving practical problems and combine the general education with the idea

of each individual doing his job well. Recognition should be given to achievers and their accomplishments should be publicized to establish a model for others to learn from. Socialist labor competition should be broadened and deepened in order to guide the vast ranks of coal mine workers to become models of maintaining the four fundamental principles, of building the spiritual civilization of socialism and of creating new records in production.

In the process of making Shanxi a strong energy base as soon as possible, the industrial structure and the entire economic structure of Shanxi need to be changed step by step. Further development of the coal industry must rely on the development of agriculture, light textile industry and science and technology. Within the heavy industry, there are already changes toward serving the construction of an energy base. The communication and transportation departments are also strengthening the existing railroads and highways and constructing new roads to accommodate the transfer of coal from the province. The commerce and service departments have also done extensive work to improve their service and supply to the mining community and have accumulated useful experience. All in all, a large-scale provincewide socialist collaboration involving all the relevant branches and departments is taking form in making Shanxi an energy base for the cause of the national situation. This large joint effort in socialism, capable of creating new production power, certainly will continue to grow and develop in the course of further promoting economic readjustment and political stability. This effort will consistently provide the coal industry and the coal producing workers with firm support and coordination by various branches.

Stalin once said that coalminers sacrifice their own sunshine and give light and heat to the people. The 400,000 coal mine workers are a heroic team that love the party, socialism, and their posts, they are a team that are unafraid of hard and tedious work. It is this team that have mined a cumulative total of more than 1.3 billion tons of coal and accumulated 6 billion yuan of construction capital for the nation. They have plenty of practical experience whether they are mining with advanced machines in large and medium-size modern coal mines or producing coal by traditional methods in small coal mines. The tasks before us now are to consolidate the exchange of experience and to further strengthen the team by grasping well the training of all personnel and continually raising the political understanding, technical level, and the sense of organization and discipline of the coal mine workers. This is the most important work in building an energy base and taking advantage of a local situation for the cause of the national situation. We hope that all the coal mine leaders are determined to make great efforts to carry out the very important foundation work of building up the best possible team of workers.

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CSO: 4006/285

EFFORTS TO STEP UP SUPPLY OF COAL GAS TO CITIES REPORTED

Coal Gas Company Initiative

Beijing BEIJING RIBAO in Chinese 8 Apr 81 p 1

[Article by Liu Tingzhao [0491 7200 2507]: "Coal Gas Company Takes Initiative and Provides Fast Installation for Dozens of Units"]

[Text] After a discussion on how to "serve the people and be responsible to the people," the municipal Coal Gas Company has taken the initiative and is striving to eliminate procrastination in coal gas installation and speed up the installation engineering in the residential areas of Jinsong and Tuanjie Lake, where 12 locations have now been officially supplied with gas.

The installation of a coal gas supply for civilian, educational, commercial and service units in the Jinsong and Tuanjie Lake residential areas involves a large amount of work and a number of departments; overall organization and planning are required. In the beginning, it was suggested that the largest unit--the Tuanjie Lake General Merchandise Store--should take the lead. This store submitted, however, that it is a peer unit to other stores and could not assume a leading role. The stores suggested that their superior, the Chaoyang Ward financial management, should take the lead. The financial management was concerned that units under its jurisdiction might become reliant upon the ward and cause the ward financial losses. Then everybody expressed the hope that the Coal Gas Company would take the lead. The thinking at the Coal Gas Company was that in installing a gas supply, the usual procedure has been that the customer made the request and the company carried out the installation. It was not the company's responsibility to come out and help solve problems among the customers in installing a gas supply. Besides, some of the units were short of materials and funds; if the company were to take the lead, it would have to look for the capital and materials, and it would obviously be taking on an additional burden. So the Coal Gas Company did not want to take the lead either. Since the burden was passed from one unit to another and nobody wanted to assume the responsibility, coal gas installation for these units was progressing very slowly, with delays as long as 6 months. Some schools, stores and service posts delayed opening for business, which affected the move-in schedule and the daily life of the residents.

In the "serve the people and be responsible to the people" discussions, leaders of the Coal Gas Company changed their old passive attitude of "waiting for others to call us, we don't call them", took the initiative and coordinated well with other units. Late in February, the Coal Gas Company held two "coordination meetings for local coal gas engineering" and invited the comrades in charge at the Chaoyang Ward grain bureau, nonstaple foodstuffs company, education bureau and a dozen other units to discuss the coal gas connection for the 3 schools and 36 commerical and service units in the Tuanjie Lake and Jinsong residential areas. At the meetings, the gas company open-mindedly solicited the opinions of the units and, based on customer requests, grouped and ranked the coal gas installation for all locations according to the size and urgency of the projects. Comrades in charge and technical personnel were immediately dispatched to the network points to make on-site investigations and surveys and to work with the customer in completing a concrete construction plan. Because seven service units at Tuanjie Lake will share the same coal gas pipeline in the same building, conflicts would be likely to occur if the pipelines were installed improperly. The Coal Gas Company held discussions with the customers at the installation site and took the proper technical and safety measures to determine the layout of the coal gas pipelines and the furnaces. By doing so, the seven units had a common understanding of the project and that insured the normal progress of the installation.

The Coal Gas Company played a leading role not only in organizing the work but also in actively helping the customers to overcome some of their actual difficulties. According to the regulations, the requesting customer must have the funds and construction material ready before the Coal Gas Company can accept the installation job. But the post office of the Jinsong residential area does not have any construction material and the sixth elementary school of the area does not have any funds. The Coal Gas Company came up with pipes, construction materials and parts intended for their own repair and maintenance use and also made a 2,500-yuan advance for the sixth elementary school so that the gas installation at these two places could be carried out.

9698
CSO: 4006/286

New Taiyuan Coal Gasification Company

Taiyuan SHANXI RIBAO in Chinese 2 Jun 81 p 1

[Article by Zhou Enying [0719 1869 5391]: "Taiyuan Coal Gasification Company Officially Founded"]

[Text] The Taiyuan Coal Gasification Company, to be operated jointly by the Ministry of Coal Industry and the Shanxi Province government, has recently been approved by the State Council and officially founded. Establishment of this company will greatly speed up the coal gasification construction in Taiyuan city, and the wishes of the people of Taiyuan for a coal gas supply as quickly as possible and for rapid elimination of environmental pollution will soon be realized.

The principal missions of the Taiyuan Coal Gasification Company are to supply coal gas to Taiyuan city and to carry out integrated utilization of coal. The coal gasification construction engineering includes mining and washing of coal, gasification and pipeline network. Capital needed in the construction is invested by both parties in the joint operation--the Ministry of Coal Industry is responsible for the mining and washing of coal and the Shanxi Province government is responsible for the gasification and the pipeline network. In order for Taiyuan to realize coal gasification in stages and installments and to obtain the optimum economic effects, unified planning, design, construction and operation will be adopted. For this reason, a civilian coal gas supply from chemical plant and mine recovery will aslo be under the unified management of the Taiyuan Coal Gasification Company.

The Ministry of Coal Industry and the Shanxi Province government decided that multiple gas sources are required to provide a coal gas supply in Taiyuan city. The first step is to exploit the advantage of abundant coking coal around the city, gradually build up a coking plant that produces 1.8 million tons of coke per year, generate coal gas in the coking process, and export the coke and retain the coal gas for use in Taiyuan city. The goals of the coal gasification are to supply coal gas to the majority of the 1.2 million urban population, convert coal burning to gas burning in plants that are in the position to do so, and fundamentally solve the air pollution problem of Taiyuan. The engineering construction for coal gasification should be carried out in two steps based on the spirit of orderly progression and within the capabilities. The first step is to build a gas-producing coking oven of a capacity of 400,000 tons per year as quickly as possible so that household gas can be supplied to one-third of the Taiyuan residents. The second step is to build another gas-producing coking plant with a capacity of 1.4 million tons per year in order to provide coal gas for the household use of 1 million Taiyuan residents and some of the plants. The principal gas production equipment and refractory material for the 400,000-ton coking oven are already on hand and the preliminary design has also been completed. Contracts for water, electricity, transportation, land and material have all been signed and preparatory work prior to construction will basically be underway in 1981. Efforts are being made to have the official ground-breaking in 1982.

Moreover, the recovery, purification, external gas storage tank and supply pipeline network engineering projects of other gas sources under the unified management of the Taiyuan Coal Gasification Company, such as the coking oven residual gas and the methyl alcohol blowout gas at the Taiyuan Chemical Fertilizer Plant, started in December 1980. First-stage construction engineering is expected to be completed before the National Day in 1981; the 15,000 households located between the chemical fertilizer plant and Xiayuan will be the first users of the coal gas coming from the chemical fertilizer plant. When the second-stage engineering is completed in 1982, an estimated 40,000 families will be supplied with coal gas. The first stage of the paraffin-splitting liquefaction gas engineering at the Taiyuan Detergent Plant is completed except for the technically more difficult assembly of the compressor facility. It is expected to be completed and come on line before the National Day.

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CSO: 4006/381

REVIEW, OUTLOOK FOR HYDROPOWER DEVELOPMENT DISCUSSED

Eastern Power Grid

Beijing SHUILI FADIAN [WATER POWER] in Chinese No 1, 12 Jan 81 pp 4-7

[Article by Yang Degong [2799 1795 0501] of the Survey and Design Academy Under the Ministry of Electric Power Industry: "Review of and Outlook for Hydropower Development in Eastern China"]

[Text] I.

The water energy resources in the six provinces and one municipality of Eastern China form only a very small part of the national potential. However, they were developed rather early. Construction of the hydropower stations at Huangtankou in Zhejiang and Gutianxi in Fujian began one after another shortly after liberation. Because of the lack of experience in the construction of large and medium-size hydropower stations, problems soon cropped up and we took the wrong path. With the establishment of the General Bureau of Hydropower Generation under the Ministry of Fuel Industry, leadership over hydropower construction was strengthened and during the first 5-year plan, large and medium-size hydropower stations were built at Shangyoujiang, Gutian, Huangtankou and Xinanjiang, giving us valuable experience. In addition to supplying electricity for industrial and agricultural production in various regions, these construction projects also played an important role in building up a hydropower construction contingent. Even now, the one-level two-stage construction at Xinanjiang, Shangyoujiang and Gutian enjoy high prestige because of their short construction periods, fine work quality and small investments.

By 1979, hydropower stations completed and under construction in Eastern China (excluding those below 500 kW) were capable of exploiting 22.5 percent of the water energy potential, and there are large and medium-size hydropower stations of around 9 million kW and small stations of more than 5 million kW to be exploited later. If the potential in Eastern China can be fully exploited, there will be an average annual power generation of 51 billion kilowatt-hours. At the consumption rate of 400 grams of standard coal per kilowatt-hour, this is equivalent to a large coalfield with an annual output of 20.4 million tons of standard coal for a long time.

Hydropower construction in Eastern China has not been smooth sailing. During the Great Leap Forward in 1958, the "three simultaneous" [simultaneous design, construction and operation] was vigorously enforced because of the evil influence of the "wind of exaggeration" and high targets. The construction sites were determined hastily and the construction of many large and medium-size projects was started at the same time, even though the scope of work undertaken was beyond the limits of our national financial and material resources. This was followed by 3 years of difficulty and the construction had to be halted, resulting in great waste and loss. The lessons learned from such rash action, disregard of capital construction procedures and failure to concentrate efforts on specific jobs should be learned well.

When construction was resumed lat r and the closed or suspended large statio s had to be dealt with, no serious analysis or research was carried out on the long-range strategic layout for hydropower development. Furthermore, no clearcut policy decision was worked out on such questions as whether the construction of Oujiang Hydropower Station in Qingtian County, Zhejiang, or the Jianxi Station of Fujian should be continued at a reduced scale, even though heavy investments had been expended on them and people had already been mentally prepared for the removal of homes from the reservoir areas. Thus everything remained in suspense pending a protracted review of the plans for the river basins. Finally, the projects in Qingtian and Jianxi were criticized as typical examples of grasping for things grandiose and foreign, and since then, nobody has ever proposed the resumption of the projects according to the original plans. The time has now changed, the population of the reservoir areas has swollen; and production and construction in both urban and rural areas are undergoing large-scale development. However, it is no longer possible to build these large hydropower stations according to the original plans. At present, there is a compulsory revision of the plan for the development of the Oujiang River basin so that the single-level dam in Qingtian can be developed as a multilevel dam. In terms of energy, this means there has been an annual loss of more than 700 million kilowatt-hours of electricity and a 4 million kW capacity. Th~ case of the Jianxi Hydropower Station is even worse. This is a key project in the strategic plan for Fujian's hydropower exploitation and plays an important compensatory and regulative role. Since the reservoirs cannot be built according to the original plans, the setting up of two power stations at Shuikou on the lower reaches of the Jianxi River will mean an annual reduction of 3 billion kilowatt-hours of electricity and some 600,000 kW of guaranteed pow~r. The losses from the Qingtian and Jianxi stations have greatly affected the energy resources of the Fujian and Eastern China power grids.

From 1960 to 1965, hydropower construction in Eastern China was mainly for the purpose of filling in the blanks in addition to preparations for the resumption of a small number of projects. No new power generation center was built. During the Great Cultural Revolution, both design and construction were seriously disrupted. The cascade power station at Gutianxi was not completed until 1974, after 24 years of construction. Had it not been for the dispersal of forces, materials and funds in 1958, it is estimated that all four cascades could have been completed in 1964, and the construction period would have been shortened by 10 years.

A review of hydropower construction in Eastern China raises many thought-provoking questions. The following three points first come to mind:

1. Selection of the site is a fundamental task. Projects were carried out at Shangyoujiang, Gutian and Xinanjiang during the first 5-year plan after a comparison of alternate plans for the development of the river basins and the selection of the best. All these sites were easy to develop. Therefore, we had a clear idea of the task to be performed, the people to enjoy the benefits of power supply, and the great economic advantages. After completion, these stations became the backbone power sources of these localities and proved to be good investments. In the second half of 1958, projects were started hastily without selection of sites according to the river basin plans or a comparison of alternate regional plans. Therefore, they left behind many problems. The problems would be even greater and the adverse effects more serious if large-scale engineering projects had been started hastily. A glance at these conditions will show that a planned selection of sites, including a comparison of many alternate river basin plans and regional plans, is a strategic action in hydropower construction which should be highly regarded.

2. Survey, design and construction must be carried out well and the timely supply of construction funds and materials must be assured. These are mandatory for the construction of hydropower stations with greater, faster, better and more economical results. In the course of construction for the one-level two-stage projects at Shangyoujiang and Gutian, and the project at Xinanjiang, both design and construction were conscientiously carried out with a high regard for work quality. As soon as these projects were determined upon, both investment and material supplies were assured. Thus the general work progress was ahead of schedule. For instance, preparations for the Xinanjiang project began in the second half of 1956; the main project began in April 1957; and by April 1960, the first set of equipment was able to generate power. The whole project took only 3 and 1/2 years. Again, the Shangyoujiang project was started in 1955 and power was generated by 1957. The whole project took less than 3 years. Construction of the one-level two-stage project at Gutian began in July 1957, and power was generated by October 1959. The whole project took slightly more than 2 years. From these instances we can see that as long as there is proper and meticulous preplanning and the assurance of funds and materials, the construction period of hydropower stations can be shortened. The "beard-growing" projects which occurred later were mostly attributable to crude survey and designs--which account for the difficulty in working out a construction plan--poor work quality and the unreliable supply of funds and materials. The interference and sabotage by Lin Biao and the "gang of four" further prolonged the construction period.

3. It is very important that strong support for hydropower development can be counted on from various quarters, because the building of large hydropower stations involves a wide range of problems. When several projects were carried out during the first 5-year plan, the localities adopted an attitude of mutual concern and active support in such matters as assignment of cadres, supply of materials, allocation of manpower, relocation of people in the reservoir areas, and coordination of transportation and forestry. As a result, the construction proceeded smoothly. Now, very high demands are being made on the hydropower construction departments in matters of relocation of people, transportation, forestry and posts and telecommunications. These demands have added to the burdens of investment and workload for hydropower projects and reflect a change from the former attitude of

mutual concern for the development of hydropower. To facilitate hydropower construction hereafter, it is necessary to formulate rational policies as a satisfactory solution to these problems.

II.

Eastern China's water resources are mainly concentrated in Fujian, Zhejiang, Jiangxi and Anhui. Many water resources in Anhui and northern Zhejiang have been developed, and the main efforts should be directed toward the exploitation of those in southern Zhejiang, Fujian and Jiangxi. The Ministry of Electric Power Industry has defined that region as one of our national hydropower bases which are of great significance in promoting hydropower construction in Eastern China.

There are two very distinctive cnnstruction tasks for the development of the Fujian-Zhejiang-Jiangxi hydropower base: First, we should increase the capacity of the existing Eastern China power grid for peak adjustment, frequency modulation and standby purposes, and reduce the consumption of crude oil and coal in order to create conditions for a better power supply from these power grids, a more economical operating water level, and an expansion of the power grids to integrate with those in Fujian. Second, we should accelerate the economic development of the regions concerned through the supply of local electricity. We have to rely mainly on the efforts of various provinces in setting up small and medium-size hydropower stations to bring about such development.

To increase the capacity of the existing Eastern China power grid for peak adjustment and frequency modulation, we should hereafter actively carry out the construction of large and medium-size hydropower stations in the river basins of Oujiang and Feiyunjiang in southern Zhejiang, and the Minjiang River basin in Fujian. According to data from existing plans, there are five cascades in the Oujiang River basin totaling 1.06 million kW, with an average annual power generation of 220,000 kW, which can be gradually developed. It is anticipated that by 1990, we will require a peak adjustment capacity of approximately 4.5 million kW. After deducting the peak adjustment capacity of the thermopower stations now in existence, we still need an increase of 2.5 million kW of peak adjustment capacity, and reliance on the development of hydropower in southern Zhejiang alone is not enough. Therefore, we must take early action to develop the hydropower of northern Fujian. The Shuikou power plant on the trunk of the Minjiang River is an ideal one for further development. This station will be the largest hydropower station in Eastern China. It enjoys good geological conditions for construction, and seasonal adjustments can be carried out on the reservoirs. At a 95-percent guaranteed utilization rate, it will have a capacity of 260,000 kW, and after the completion of reservoirs along the tributaries, the capacity can be further raised to above 300,000 kW, with a final installed capacity of 1.4 million kW. The average annual power generation will remain at 4.95 billion units for many years. When the Shuikou Power Station is linked up with the hydropower stations of Xinanjiang and Fuchunjiang and compensatory adjustments are made, full play can be given to the regulative role of the Xinanjiang Reservoir, and even in dry seasons the capacity of the Xinanjiang Hydropower Station can be raised to more than 50,000 kW. This will create favorable conditions for increasing the installed capacity and the frequency modulation and peak adjustment capacities. The Shuikou Power Station

will also be a junction station when the Eastern China power grid moves southward to join up with that of Fujian, and through the power transmission lines from the Shuikou station to the Eastern China power grid, the vast hydropower resources of Fujian can be better utilized. Besides Shuikou, there are still 10 billion units of power energy in the Minjiang River basin to be exploited and utilized. Among them are the power stations at Shaxikou and Jiemian, and their construction within the next decade can be considered.

Fujian is quite poor in coal and petroleum, but rich in water resources. We should take advantage of this strongpoint by developing hydropower, working out long-range plans for hydropower construction and by carefully planning the capital construction procedures for various types (runoff, regulation) of power stations so that the problem of load used can be solved by basically relying on hydropower stations. The Mianhuatan Hydropower Station in southwestern Fujian should be developed early as the backbone power source of the south in Fujian's unified provincial power grid. There are also many cascade power stations along the Muyangxi River and the Huotongxi River in eastern Fujian and along the Jinxi River, the Shaxi River, the Dazhangxi River and the Jianxi River in northern Fujian which can be gradually developed and utilized.

Jiangxi Province is fairly rich in water resources, and hydropower development should be encouraged there. First, we should build the Wanan Hydropower Station, and then we should plan for the construction of a number of medium-size power stations, such as the Guting Hydropower Station on the upper reaches of the Shangyoujiang River. The Xiashan Hydropower Station in the Ganjiang River basin is a key project in the development of this river basin with great advantages in power generation and flood prevention. However, a lot of land will be inundated and many people will have to be relocated. Therefore, plans should be worked out early.

Based on the requirements of the Eastern China power grid and the power requirements of Fujian, Zhejiang and Jiangxi, plans for the construction of hydropower bases in these three provinces for the next 10 years are now being worked out for the Eastern China Power Administration Bureau and the power bureaus of these provinces. The Eastern China Survey and Design Academy intends to build 13-15 power stations in 10 years with a total capacity of 4.2-4.6 million kW and an annual power generation of 14-15 billion kilowatt-hours. Five of these stations will be set up in southern Zhejiang and four will be in Fujian, where it has been proposed that the Jiemian Hydropower Station designed by the provincial design academy will soon be included in the capital construction plan. There will be three stations in Jiangxi, where the Wanan station is now being designed by the Changjiang staff office. In addition, two other stations, the Huangtankou and Hunanzhen stations, can still be expanded in order to increase the peak adjustment and standby capacities of the Eastern China power grid.

Apart from its hydropower resources from rivers, Eastern China is also rich in tidal energy. In Zhejiang, Fujian and Jiangsu Provinces alone, there is a potential for 230 billion units along the coast. Zhejiang has already set up the Jiangxia Tidal Energy Experiment Power Station with an installed capacity of 3,000 kW, and the first generating unit with a capacity of 500 kW has been in formal operation since last May.

Despite the problems of heavy investments in construction, large amounts of materials required for the generating units, corrosion from sea water and silt, and complexity of construction, tidal power stations have the advantage of regenerative energy and require very little inundated land and relocation of people. They also provide facilities for sea water breeding, extraction of precious metals (including uranium) and many economic advantages for comprehensive utilization. Tidal energy can also be fully utilized in the joint operation of large hydropower and thermopower stations in large power grids. Therefore, in developing future tidal energy resources in Zhejiang and Fujiang, it is proposed that the Jiangxia Tidal Power Station be used as a base for scientific experiment, and that we should also proceed with the planned selection of sites, the experiment of generating unit designs, the prevention of corrosion by sea water and microorganisms, research in the laws of silting, study of the methods of design for building structures in deep water bays, and so forth. It is also proposed that scientific research on tidal energy be included in the program of energy scientific experiments and that the state should annually allocate funds for this purpose. If necessary, special organizations should be set up and charged with responsibility for organizing and coordinating this work with other related scientific experiments.

The coal and water resources in Eastern China, in our opinion, are quite inadequate for future power consumption. By the year 2000, it is likely that nuclear power stations will be vigorously developed, while thermopower factories will make use of high-efficiency equipment with high single-unit capacity to meet the future growing demands. Based on the available load of the Eastern China power grid and the distribution of energy resources, we can see that the load will be concentrated in Shanghai, southern Jiangsu, northern Zhejiang, Nanjing, Wuhu and the narrow strip of land along the banks of the Changjiang River; while coal resources are in Huainan, Huaipei, northern Jiangsu and southern Shandong; and water resources are in Zhejiang and northern Fujian. These resources are all too far away for power transmission to the area of load concentration. To take better advantage of the nuclear power stations and high-capacity generating units, we should, as we have observed from international experience, build water-pumping and energy storage stations in southern Jiangsu, southern Anhui, northern Zhejiang and other areas that are close to the area of load concentration, in order to solve the problems of peak adjustment and absorption of residue electric energy late at night. According to planning, surveying and research in recent years, there are a number of water-pumping and energy storage power stations which can be developed, such as Xiangshuijian and Xixingchong in southern Anhui. It is proposed that planning and research be started at locations suitable for water-pumping and energy-storage stations, and then two or three feasibility reports be drawn up for further preliminary design in an attempt to build a water-pumping and energy-storage power station of about 300,000 kW during the seventh 5-year plan. This will reduce the difficulties resulting from overloading, improve the working conditions of hundreds of thousands of workers, and pave the way for building large energy-storage power stations in the future.

III.

In hydropower construction, Eastern China still faces several problems which must be resolved.

1. The question of strengthening and formulating long-range plans: Based on the special characteristics of Eastern China, such as its scattered hydropower resources and the large number of small and medium-size stations, we must follow the state's long-range plans and energy policies in order to avoid the indiscriminate addition of projects. Through comprehensive study of the characteristics of power load and the methods of developing river basins as well as the plans of regional economic development, we should work out long-range plans for hydropower construction and determine the sites for development and their order of priority as the basis for surveying, designing and annual planning. There should be no gaps left between surveying and designing, or between designing and construction, so that our limited forces and funds can be used to the best advantage and the waste of time and resources avoided. Hydropower construction plans already determined should be relayed by the central authorities or the provinces to various counties and communes in the appropriate manner. Capital construction projects should be prohibited below the backwater line of reservoirs so as to avoid losses from extended inundation.

2. The question of reforming the present capital construction procedures and the readjustment of planning stages: According to the present regulations on capital construction procedures and methods of administration, preparations for construction can be carried out only when the preliminary design has been approved. Preliminary design involves a very great deal of work, and it takes 2-4 years to prepare one that is only barely acceptable for a large or medium-size hydropower station. However, if the advanced planning and site selection work before the preliminary design are insufficient and superficial, if there has not been in-depth study on the question of suitability of sites, and if no investigation has been conducted at either the central or the provincial levels on the choice of sites after a comprehensive comparison, then nobody can have any idea as to how to use the investments for maximum economic results. Sometimes, there may be a lot of redtape in connection with certain projects that is not urgently needed at all, causing waste of precious time and energy. Again, there is the usual practice of setting timelimits for the submission of preliminary design documents in order that the project can be included in the annual capital construction plan at an early stage "in accordance with" capital construction procedures. However, if important technical problems in the design have not been thoroughly studied, revisions are inevitable even after approval. In such an event, important technical changes have to be made after construction has already been started. To speed up and improve hydropower construction, it is proposed that the capital construction procedures be reformed and that readjustments be made to the work during the designing stage. Our initial idea is that more intensive planning should be carried out at the stage of site or dam selection so that part of the work specified in the preliminary design could be done at this stage. Then, on the basis of this planning, a job description could be compiled for the project. An approved job description would serve as the basis for construction preparations, financial allocations and the "construction design." Another part of the work specified in

the preliminary design together with the first part of the work specified in the technical design should be included in the construction design, and the approved "construction design report" would be the basis for compiling the construction blueprint, which then could not be changed any further. The main portion of the engineering construction could not be started without this "construction design report."

3. The question of apportionment of investments in projects for comprehensive utilization: In building hydropower stations, rational consideration should be given to comprehensive utilization for navigation, timber production, water supply, irrigation and flood prevention. This was basically the rule for building hydropower stations before. In the future, if the investments required for all these items (including long-range development) were to be borne exclusively by the hydropower construction units, then the burden of capital construction investments for the electric power industry would inevitably be increased and the construction would be slowed down or reduced in scope. Therefore, we suggest that: 1) the former joint notice from the four ministries and the documents issued jointly by the former Ministry of Hydropower Industry and the Ministry of Forestry be reconsidered, and rational and practical measures should be worked out; 2) investments should be apportioned; if they must be exclusively borne by the Ministry of Electric Power Industry, then the State Planning Commission should be asked to transfer to the Ministry of Electric Power Industry the funds originally earmarked for the departments concerned. The detailed methods could be studied and determined according to specific conditions.

4. The question of funds for relocation of people and removal of homes in reservoir inundated areas is very complex in hydropower construction in Eastern China. At present, heavy demands are being made on the issue of people's relocation, and the funds required for this purpose have nearly doubled. This is unfavorable to giving priority to the development of hydropower. In order to accelerate the exploitation and utilization of water resources and to rationally solve the problem of people's relocation in the inundated areas, it is suggested that the state should work out "reservoir laws" to be enforced after approval. All units and personnel concerned should realistically discuss and solve this problem in a joint effort to build hydropower stations in the interest of energy conservation for future generations and to contribute to the four modernizations.

In conclusion, we should say that there is a great future for hydropower development in Eastern China. It is hoped that this construction will be supported strongly by various quarters so that the water resources of Eastern China will be developed and utilized as a contribution to the four modernizations.

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CSO: 4006/372

Hejiang River in Guangxi

Beijing SHUILI FADIAN [WATER POWER] in Chinese No 1, 12 Jan 81 pp 47-48

[Atricle by Huang Zhihua [7806 3112 5478] of the Hydropower Survey and Design Section of Wuzhou region, Guangxi: "An Example of Harnessing Small and Medium-Size Rivers in Cascades--Tentative Idea of Harnessing Hydropower Potential of Hejiang River"]

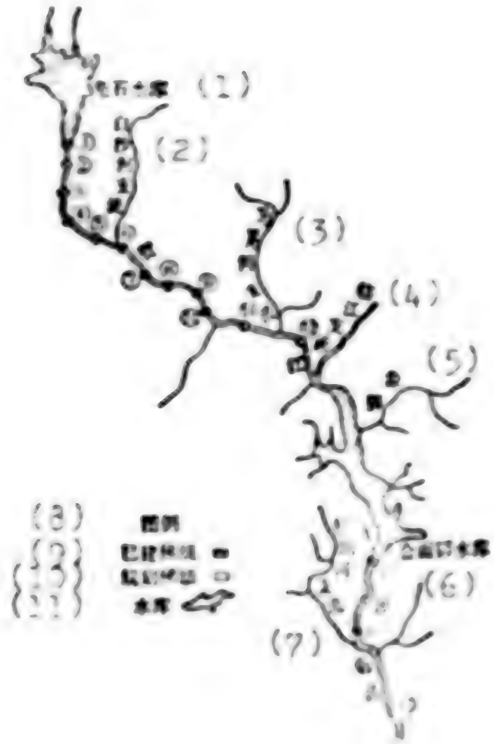
[Text] The Hejiang River is one of four large rivers in the Wuzhou region of Guangxi. It is 186 km long inside the region, with a natural drop of 146 meters, and controls a valley area of 7,030 square kilometers. The average flow for many years has been 240 cubic meters per second. Its greater tributaries are the Linjiang, the Maweihe and the Paishahe. It also has 44 small tributaries, and is very rich in water resources. According to preliminary statistics, the total water energy potential in the entire valley is 242,000 kW. At present, the installed capacity of the small hydropower stations already built totals nearly 100,000 kW. For many years, the average annual rainfall in tee valley has been 1,670 mm. There are 5 hydrology stations and 17 rainfall stations and weather stations which have been carrying out on-the-spot observations for more than 22 years, supplying valuable hydrologic data for the development of the Hejiang's cascades.

The main course of the Hejiang is a combination of two river course --the Fujiang and the Hejiang. The Guishi Power Station on the first cascade of the Fujiang River was built at the end of the 1950's and the beginning of the 1960's, and was completed and commissioned in 1963. The total capacity of the reservoir is 178 million cubic meters, with an installed capacity of 12,000 kW. To further utilize the power station's tailwater for power generation and irrigation, all the counties and communes in the lower reaches have taken advantage of the gentle slope of the riverbed, the flat land surface on both banks, the concentration of urban and rural populations and the centralized farmland, and, in accordance with the principle of less inundation and no removal of homes, built cascades at Chengxiang, Jiangjia, Yangtou, Huangshi, Fanglin, Xiadao and Longjiang. Besides giving the Hejiang the features of "one-level regulation and multiple-level utilization," these people have accumulated a great deal of experience in water resource exploitation. Construction of the main power station of the Hejiang cascades--the Hemianshi Power Station with a total reservoir capacity of 235 million cubic meters, an installed capacity of 68,000 kW, and a designed irrigation area of 103,500 square mu--began in the early 1970's. After its completion, there will be a unified power grid embracing Fuchuan, Zhongshan, Hexian, Cangwu and Wuzhou. This will not only greatly improve the power situation in Wuzhou region, but will also reduce the heavy burden of transporting coal from the north to the south. According to preliminary statistics, the two thermopower plants in Xiwan and Wuzhou alone can annually help the state save more than 200,000 tons of coal and more than 3 million yuan in transportation expenses. The entire investment can be recovered 3 years after the power station goes into operation.

For a rational layout and the planned and designed exploitation of the water resources of the Hejiang, we have made certain changes to some aspects of the cascades

considered to be a little irrational when we planned and designed for the small and medium-size rivers in 1978. In the disjoined portions of the cascades from Guishi down to the Hemianshi Reservoir, we built the Longjing, Lengshuichang, Dajiangzhai and Gongdong cascades according to the standard course of a canal. As to water transportation, we planned to extend the navigation route to Zhongshan.

We also carried out planning on the tributaries of the Hejiang. Since the upper reaches are mountainous, the middle reaches are broad and there are gorges in the lower reaches, and because of relatively less inundation which would require the removal of homes, on the lower reaches it would be easy to build high dams and large and medium-size reservoirs, and to improve the power stations for irrigation, power generation, flood prevention and regulation. These measures are of great, practical significance in making full use of the existing equipment in the Hemianshi Power Station. Therefore, on the tributaries, we have planned and designed the building of reservoirs in Xiangshi, Matao, Nantang and Liuyang with a total capacity of 481 million cubic meters. After the completion of the construction, it is estimated that the power stations on the lower reaches can be regulated each year to increase the amount of electricity by 331 million kilowatt hours, which is equivalent to the capacity of a newly built Hemianshi Power Station. On the 37 km course from the lower reaches of the Hemianshi to Fulong, we have planned for three cascades at Xindu, Shijue and Fulong with a total installed capacity of 26,000 kW. After the completion of these cascades, and because of Guishi on the upper reaches, Hemianshi and the newly built reservoirs with a capacity of more than 1 billion cubic meters for flood prevention and regulation will become a power station with the highest utilization rate in Wuzhou region, and the navigation along the trunk of the Hejiang will be free from any obstacle.



Layout of cascades on main course of the Hejiang

Key:

1. Guishi Reservoir
2. Baishahe Tributary
3. Maweihe Tributary
4. Linjiang Tributary
5. Xiangshi
6. Hemianshi Reservoir
7. Lindonghe Tributary
8. Legend
9. Completed Cascade
10. Planned Cascade
11. Reservoir

The layout of cascades on the main course of the Hejiang can be seen from the above diagram. The features of the cascades are as follows:

A	B	C	D	E	F	G	H	I
(1)	[illegible]	1230	30.4	33	12000	5470	6500	J
(2)	[illegible]	1300	32.1	5.5	1000	678	720	K
(3)	[illegible]	1370	33.8	4.0	990	530	605	K
(4)	[illegible]	1435	35.4	5.0	1600	674	[illegible]	J
(5)	[illegible]	1453	35.9	4.3	960	377	662	K
(6)	[illegible]	1482	36.6	4.0	640	370	297	J
(7)	[illegible]	1610	40.8	5.0	1063	785	635	J
(8)	[illegible]	2000	49.4	4.7	1000	458	474	J
(9)	[illegible]	2248	56.6	3.5	583	340	365	J
(10)	[illegible]	2566	63.5	1.5				L
(11)	[illegible]	2700	66.7	3.5	500	338	391	J
(12)	[illegible]	3110	78.5	4.7	4000	1470	2120	K
(13)	[illegible]	6260	214	35	60000	17000	36000	J
(14)	[illegible]	6348	216	6.3	10000	4900	5448	K
(15)	[illegible]	6500	222	1.5				L
(16)	[illegible]	6920	236	4.5	8000	4350	4240	K
(17)	[illegible]	7030	240	5.0	8000	4780	4960	K

Key:

- A. Number
- B. Cascade names
- C. Controlled valley area (in square kilometers)
- D. Average annual flow for many years (cubic meter/second)
- E. Designed peak of flow (meter)
- F. Installed capacity (kW)
- G. Guaranteed generation (kW)
- H. Average annual power generation (10,000 kilowatt hours)
- I. Remarks
- J. Construction completed
- K. Planned
- L. Completed water turbine station
- (1) Guishi
- (2) Longjing
- (3) Lengshuichang
- (4) Chengxiang
- (5) Dajiangzhai
- (6) Jiangjia
- (7) Yangtao
- (8) Huangshi
- (9) Fanglin
- (10) Babu
- (11) Xiadao
- (12) Gongdong
- (13) Hemianshi
- (14) Xindu
- (15) Longjiang
- (16) Shijue
- (17) Fulong

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CSO: 4006/372

Management of Small Stations

Guangzhou NANFANG RIBAO in Chinese 15 Jun 81 p 1

[Article by Weng Zuoxiang [5040 0155 4382], Luo Jianshan [5012 1696 1472] and Bai Shanhua [4101 0810 5478]: "Management of Small Hydropower Stations Strengthened for Improved Economic Efficiency"]

[Text] A national symposium on improving the economic efficiency of small hydropower stations was held in Yangshan County, Guangdon Province, from 1 to 9 June. Engineers and technical personnel engaged in small hydropower research from 25 provinces, municipalities and autonomous regions, experts and scholars of universities and research institutes, and administrative comrades of relevant departments, a total of 140 people, attended the conference.

During the conference, representatives heard reports on experience in strengthened scientific management and improved economy of small hydropower stations in Yangshan County and other places in China. Penetrating studies were conducted on a number of special topics on improving the economic efficiency of small hydropower stations; 44 technical papers were presented and exchanged. The consensus of the discussion was that small hydropower stations have made great progress in China since the revolution, and especially in the past few years. Up to the end of last year, 88,000 small hydropower stations had been built in China, with a total machine capacity of 6.93 million kilowatts and an annual generation of 12.7 billion kilowatt-hours. Among the 2,000 counties (banners), 1,478 have now small hydropower stations. This is a substantial force in China's energy construction and is an important supplement to the major electrical networks.

It was also pointed out that China has numerous small and medium rivers which provide a bright future for small hydropower stations. Not many of these water resources have been developed, and even among the ones with small hydropower stations, some have not yet fully developed their potential. Participants at the conference made a number of suggestions; they expressed the belief that in the period of national economic readjustment, the most important task is to shift the emphasis at small hydropower stations to readjustment and stepped-up management. The attitude of construction first and management second must be overcome, and scientific management, readjustment, systematization, and development of potential must be carried out seriously at existing small hydropower stations. Electrical loads should be actively developed and annual utilization hours improved so that the efficiency of existing facilities can be fully developed.

The symposium was jointly sponsored by the specialty committee on rural electricity of the China Electrical Engineering Association and the Bureau of Agriculture and Water Conservation of the Ministry of Water Conservancy and Electric Power.

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CSO: 4006/381

GROWTH OF ELECTRIC POWER INDUSTRY DISCUSSED

Hong Kong CHING-CHI TAO-PAO [ECONOMIC REPORTER] in Chinese No 19, May 1981
pp 8-9

[Article by Zhong Ping [0112 1627]: "Development of the Chinese Electric Power Industry in 1980"]

[Text] In 1980 the Chinese electric power industry completed all the national plans above norm. A total of 300 billion kilowatt-hours of electricity, which represents a 6.4-percent growth and is 10 billion kilowatt-hours more than originally planned, were produced, insuring that the electrical demand of an 8.4-percent growth in industry were met. Generators with 2.48 million kilowatts of capacity were installed, making the national total generator capacity 60.25 million kilowatts; 5,532 kilometers of transmission lines of 110 kilovolts or higher were completed, which exceeded the planned level by 36 percent; and major technical and economic indicators such as coal consumption and equipment operation also reached or exceeded the best level in history. The nation's agriculture, light textile industry and people in cities and towns were basically guaranteed an electricity supply and the quality of the electricity was also noticeably improved. But due to the excessive deficit of the past, the problem of a severe imbalance between the electric power and the national economy has not been completely resolved. The problems of unbalanced generation, transmission and transformation of electricity within the electric power industry have not been completely solved either. Although the shortage situation of some inland electric power networks has been temporarily improved, electric power is still in short supply for major networks of coastal industrial bases in northeast China, the Beijing-Tianjin-Tangshan area, and eastern China, and for some provincial networks as well.

In 1981, the electric power industry is continuing to move forward on the basis of the 2 years of readjustment and is striving to do well in making internal adjustments, generate more electricity, provide better electric service and make a greater contribution to the national economic readjustment. The electric power industry mainly needs to do well in the following 10 areas:

1. Make good use of limited capital construction investment for optimum effect.

With capital construction investments greatly reduced in 1981, the electric power industry still remains a high priority in China, with an investment equal to

9.1 percent of the total national investment, an increase of 2 percent from 1980. Within the Ministry of Electric Power Industry, the investment direction continues to adjust the proportion of generation and delivery of electricity, to increase the investment in the transmission and transformation of electricity, and to strengthen the weak links in this area. In 1979 the investment in the transmission and transformation of electric power increased from 13.2 percent to 17.2 percent of the total investment of the entire electric power industry; it further increased to 22.3 percent in 1980, and this year it is continuing to increase to 28.1 percent. The investment in hydroelectric power is rising from 48 percent of the industry total investment in 1980 to 50 percent in 1981, and thus is creating favorable conditions for major developments in hydroelectric power. In order to get the maximum impact, the capital construction investments are mainly concentrated on priority engineering projects, including the Gezhou Dam project, projects to bring a dozen hydroelectric and thermoelectric power stations on line, major power transmission and transformation projects, and preconstruction preparations. Seven new construction projects are also being added in 1981.

2. Strive to complete the 305 billion kilowatt-hours electricity generation plan above normal and raise the quality, production safety and equipment operation to new levels.

According to the national economic development plan for 1981, electricity generation is set at 305 billion kilowatt-hours, out of which 50 billion kilowatt-hours are hydroelectric. This goal has room for improvement; if the fuel supply is more abundant than planned and the water situation is better than expected, the generation of additional electric power is possible. The quality of the electric power, safety in production, and equipment operating condition will also be raised to a new level in 1981. In the area of quality improvement, the current task is to simultaneously improve the frequency specification and solve the problem of electric voltage not up to specification. The proportion of class I generation facilities will be gradually increased from 41 percent to over 50 percent.

3. Concentrate on priority engineering programs under construction and final-stage projects.

First, grasp well the ongoing major hydroelectric construction projects at Gezhou Dam, Longyang Canyon, Dong River, and Dahua, and complete the coffer dam construction to insure safety during this year's flooding season. Second, bring 1.8 million kilowatts of machine systems into operation in 1981. Although there is a decrease in the installation of production equipment this year, the machine systems to be installed for production are all large-capacity machines with an average capacity of 120,000 kilowatts, which is twice the average capacity per machine in 1980. Third, accelerate the design, construction and operation of the 500,000-volt ultrahigh-voltage engineering projects, including the completion of 610 kilometers of 500,000-volt ultrahigh-voltage transmission line from Ping Ding Mountain in Henan Province to Wuhan in Hubei Province. The 500,000-volt high-voltage line from Yuanbao Mountain in Inner Mongolia Autonomous Region to Liaoyang municipality in Liaoning Province should be built quickly, and the 120-kilometer transmission line from Jinzhou to Liaoyang in Liaoning Province will also be

completed in 1981. In the meantime, large hydroelectric power stations and large power plant delivery networks at Gezhou Dam, Wujiangdu, Shentou, Fu-la-er-ji and Huai Bei should be undertaken. Fourth, undertake well the 24 final-stage projects (9 hydroelectric and 15 thermoelectric). Among these construction projects, wherever the main machine has come on-line for generating electricity, but the public utility system, the hydraulic engineering construction and the transmission lines are unfinished, efforts should be made to push for completion in 1981.

4. Contrive to conserve energy.

Energy conservation is a key mission in the period of national economic readjustment. Conservation is particularly important in the electric power industry. In 1980 each kilowatt-hour of electricity consumed 448 grams of coal, 9 grams less than in 1979, and saved 2.92 million tons of crude coal. In 1980 China suffered from floods in the south and drought in the north; the combined water volume of large- and medium-scale hydroelectric facilities of the nation was only 2 billion cubic meters more than that of 1979. However, by insisting on the rational use of hydraulic resources, the amount of electric power generated was 10.4 billion kilowatt-hours more than planned, which was equivalent to a saving of some 6.2 million tons of crude coal.

We need to decrease the consumption of coal, electricity and oil to a new low in 1981. The goal of national average coal consumption for supplying 1 kilowatt-hour of electricity is set at 444 grams, 4 grams lower than last year, and the line loss is set at 8.9 percent. The conversion of oil-burning machines to coal-burning machines should be continued in order to reduce the oil consumption. Concurrent with the efforts for energy conservation in the electric power industry itself, efforts should also be made to coordinate among various regions to strengthen the management of electricity consumption in order to carry out the policies of national economic readjustment. In arranging the distribution of electric power, priority should be given to agriculture, light and textile industries, energy resource industry, construction material industry, communication and transportation, and industries that serve the export business and people's livelihood. Electricity supply should be limited at those enterprises that consume large quantities of energy and produce inappropriate products. Reform proposals for the price of electricity should also be investigated in order to promote electricity conservation and the rational use of electricity.

5. Preparatory work of capital construction should be greatly strengthened.

One of the vitally important tasks in readjusting the electric power industry is to turn around the phenomenon of disorder in the preparatory work and the engineering projects under construction. The 1981 plan calls for the completion of preliminary designs to provide 6.67 million kilowatts, the execution of 14 river projects, the completion of plant-site selection and plant-site planning for 10 million kilowatts each, and the long-term planning for major networks. The various design institutes should strive to move the schedule forward, and now is the time to make proposals for the post-readjustment seventh 5-year plan and the early-stage work necessary for future development. In order to do a good job in hydroelectric planning and construction, the construction work of the three hydroelectric design institutes in eastern, south central and northwest China are being accelerated.

6. Continue to reform the network management system and broaden the test point work for enterprise autonomy.

Electric power networks in China are being placed under the concentrated and uniform management of the electricity management bureaus in the six large regions. This is different from the provincial and regional management system of the past. In doing so, a proper balance can be maintained in the generation, supply and sales of electricity; the integral nature can be maintained in the network's generation and distribution; and the maximum economic efforts can be insured. In the past year or so, progress has been made in moving toward a centralized and unified management of electric power networks. In addition to the existing electricity management bureaus in northeast and eastern China, bureaus in northern, northwest and central China have subsequently been established and a southwest bureau is also being planned and organized. Test point work on the autonomy of the enterprise and the power network will be continued in 1981, and reform will be carried out through consolidation of the national economic readjustment experience.

7. Grasp well across-the-board quality control and further improve the engineering quality.

A system of rules, regulations and codes should be established this year. Quality management and control of each engineering procedure, from construction to production and delivery, and the inspection of design, raw material and equipment that affect the engineering quality should all be strengthened.

8. Find satisfactory solutions for the problem of insufficient business for construction and building units and enterprises.

Because of the reduced capital construction program, some construction units and building enterprises do not have enough business this year. How should we solve this problem? First, we should carry out training programs for workers in these units and organize a part of the technical personnel to carry out research and develop new products urgently needed in the electric power industry. In the meantime, we should coordinate contracting or partially contracting jobs such as overhaul of power plant generators and boilers, construction of agriculture electricity supply, local housing construction, external system machine installation, machining of structures, machine maintenance and technical support. On the basis of current economic aid engineering projects to foreign countries, we should actively organize product export, contract foreign construction projects, and collaborate with foreign manufacturers in producing machinery and electrical products.

9. Strengthen scientific and technological research and work toward breakthroughs in some vital scientific research areas.

In the meantime, we must promote scientific and technological achievements so that science and technology can transform the production force as quickly as possible. Key technologies in electric power production construction and in conservation and production increase should be combined. Technical innovation and technical and scientific exchange with foreign nations should be broadly promoted to further

exploit the use of a technical information network, scientific and technical exchange and the publicizing of results in science and technology. Channels for exchanging scientific and technological information and data should be systematically broadened.

10. Strengthen the training of all staff members and workers in order to elevate the professional technical level.

During the current period of national economic readjustment, we should grasp the opportunities for worker and cadre training; this is an imperative strategy for the realization of the four modernizations. The method should be a combination of on-the-job training and rotational on-leave training. Special attention should be paid to the systematic organization of short-term rotational on-leave training. For the workers, emphasis should be on young workers 35 years or younger and key production workers at major posts. Efforts should be made to complete one round of rotational on-leave training in the 1981-85 period. For those leading cadres not familiar with the business operation, classes in production knowledge, business and technology should be provided for them. For those management cadres not familiar with the production procedure, basic courses in production should be given. In the meantime, technical knowledge reviews should be organized for upper and middle-level engineering and technical personnel so that they can acquire knowledge of new foreign technical theory and technologies not available in China.

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CSO: 4006/328

PROGRESS IN METHANE GAS RESEARCH DESCRIBED AS ENCOURAGING

National Methane Gas Conference

Beijing GUANGMING RIBAO in Chinese 18 Jun 81 p 2

[Article by reporter Song Guangming [1345 0342 2494]: "Methane Gas Research in China Shows Encouraging Progress"]

[Text] The reporter learned from the National Methane Gas Work Conference recently held in Beijing that methane research in China has progressed rapidly in recent years, some research achievements have taken effect, and the technical team of rural methane gas specialists has grown to 100,000.

In the past few years, methane gas development in China has made great progress. To date, 23 provinces, municipalities and autonomous regions have established and perfected methane gas management organizations and 700 million methane tanks have been constructed in China. Of the 700 million methane tanks, 143 milli n were new constructions after 1979 and the success rate has been better than 95 percent. Scientific research in methane gas has also increased markedly and some provinces, municipalities, counties, colleges and universities and scientific research units have set up methane gas research organizations and achieved some results. For example, scientific and technical personnel of the National Methane Research Tank-Building Coordination Group investigated various types of methane gas tanks in 20 provinces, municipalities and autonomous regions and has finished compiling a tentative edition of the "Selected Standard Models of Rural and Household Methane Gas Tanks." The newly selected hydraulic-type circular and spherical tanks are simple in structure, easy to manufacture, high in adaptability, low in cost, and provide satisfactory solutions for the interdependence between fertilizer and gas and between applicability and locality. Other achievements in research and development include the successful development of the anaerobic digestion contact technique, which has achieved a high standard; the generation of methane gas from sewage and sludge from leather plants and pharmaceutical plants; the first separation of pure methane, which filled a void in the field of methane research in China; and the successful development of electric generators running on gasoline-methane mixture and on pure methane gas. Application of these research achievements will further promote the development of methane production. The technique of methane production from plants' "three pollutants" using anaerobic fermentation is not only beneficial for environmental protection but also provides a cheap source of energy. At the Rongxian County winery in Sichuan Province, the liquid brewhouse was generating 120 tons of refuse every day and seriously polluting the environment. For this reason the winery was ordered to stop production for 8 months and suffered a loss of 1.3 million yuan in production value. In 1978, methane gas

tanks were built to produce gas from the refuse using the anaerobic fermentation technique and a methane power station was built as well. In 1980 the winery generated 580,000 cubic meters of gas at a value of 35,000 yuan and generated 216,000 kilowatt-hours of electricity, which saved more than 7,000 yuan for the winery.

It was proposed at the conference that methane research be strengthened by stepping up the manpower, material and funding support. The erroneous belief held by some people that methane gas has reached the promotion stage and that there is no further need for scientific research and the prejudice against methane fertilizer should be corrected. The conference also discussed and approved relevant documents, including "Selected Standard Models of Rural and Household Methane Gas Tanks" and "Regulations Regarding the Rural Methane Gas Worker".

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CSO: 4006/381

Methane Gas From Sludge

Shanghai WEN HUI BAO in Chinese 23 Apr 81 p 1

[Text] Shanghai has succeeded in producing methane gas by fermenting sludge from leather plants. All the experts participating in an evaluation held 2 days ago believe that this achievement has provided a new avenue in the development of energy resources, the control of the three pollutants and the development of leather production. The leather goods plants in Shanghai generate great amounts of waste water and sludge in the production process and cause serious pollution to the city environment. The sludge from the leather plants is especially hazardous because of its large volume, high concentration and complex composition. Since it cannot be discharged at will or used as fertilizer, it is even harder to process than waste water. The management of leather plant sludge has become an important issue in the development of light industry and the protection of the environment. In 1978, the Municipal Scientific Committee, the Environmental Protection Bureau and the Handicraft Industries Bureau assigned the key research mission on this issue to the Shanghai Institute of Leather Industry. In collaboration with the Shanghai Hongguang Leather Goods Plant and the Shanghai Microbiology Institute, and with the assistance of the Municipal Scientific and Technological Association, the Shanghai Internal Combustion Engine Institute and Tong Ji University, the Shanghai Institute of Leather Industry carried out a number of studies, made small and medium-scale tests and completed the assignment last October.

Two days ago, experts and researchers participating in the evaluation viewed the generation of methane gas from sludge and the generation of electricity from methane gas at the Hongguang Leather Goods Plant. It was explained that the two leather plants in Shanghai, Hingguang and Hongwei, discharge almost 100 tons of sludge a day; with this scientific achievement, 4,000 cubic meters of methane gas with a heat value of 5,500 kilocalories can be produced daily. More than 1 million

kilowatt-hours of electricity can be produced every year. The effect is even greater when the methane gas produced is used as a fuel: it will allow a savings of 1.8 million cubic meters of coal gas each year.

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CSO: 4006/338

Methane From Human Waste

Shanghai JIEFANG RIBAO in Chinese 24 Apr 81 p 2

[Article by Wu Youwei [0124 1635 1218]: "Methane Gas Production--Turning the Cities' Human Waste Into an Energy Resource"]

[Text] The idea of turning cities' human waste into an energy resource through methane gas production proposed by Zhou Shi-e [0719 1102 6166], chairman of the board of directors of the Nanjing Boiler Association, received wide response at the recent Second Congress of the Jiangsu Provincial Association of Science and Technology. As pointed out by scientists attending the meeting, the idea is simple and practical, costs little money and has practical significance for the cities' energy resources.

Each year large amounts of funds and manpower are spent on the transportation and treatment of cities' human waste, and it has long been one of the difficult problems of the city administration. It is possible to transform the waste into something valuable, to turn the human waste into energy resources? Zhou Shi-e thinks so. Zhou has engaged in teaching and research in thermal energy engineering for a long time. Chinese biological energy scientists have done extensive research in this area and have achieved results in the selection of fermentation culture and in the preparation of a rapid fermentation agent. The problems of optimum structure of the methane gas pool, constant temperature control and output automation can also be resolved under present conditions in China. The case of turning human waste into methane gas in Qingdao city is an example of a success story. At the National Work Conference on Energy Resources held in October 1980, Zhou Shi-e presented his proposal to develop city methane gas. Now he has concrete plans for his idea--the installation of 60 7-meter diameter spherical methane gas tanks in Nanjing. The tanks will be divided into 6 groups placed in the 6 wards of the city and managed by technical personnel. The methane gas produced will be used as a secondary gas source in solving the living requirements of thousands of households.

Zhou pointed out that the development of methane gas in cities is highly significant in conserving energy. Many large and medium-size cities in China have already been equipped with a coal gas supply, but at present the sole source of gas is coke furnace coal gas. This not only consumes a great amount of coal but also places a large burden on transportation. The development of methane gas as an energy resource using cities' human waste is one form of energy feedback. This closed-cycle feedback is a very powerful conservation measure and it can also reduce the energy imports. Take Nanjing city, for example. The human waste of the

1.8 million residents and the transient population can be used to produce 540,000 cubic meters of methane gas every day, equivalent to the heat released from 540 tons of coal. This converts to 190,000 tons of industrial coal a year and can meet the requirements of 800,000-900,000 residents. If only one-fourth of the human waste in Nanjing is used in producing methane gas, 40,000-50,000 tons of coal can be saved and 200,000 people can be supplied with gas. In addition, the waste water from meat processing plants, leather goods plants, and bone glue plants and the draff discharged from distilleries can also be used in methane gas production.

The development of methane gas in cities is also beneficial to the environment. Coal furnaces used by city residents are the major sources of air pollution under the 10-meter altitude level. According to test results, residential coal furnaces are the most serious polluters in Shanghai. Using methane gas will greatly reduce the cities' air and water pollution. After high-temperature fermentation, the human waste can be used as fertilizer on vegetable farms, and this process will also reduce the parasite recycle and decrease infectious disease.

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CSO: 4006/338

SPEEDY FORMULATION OF NUCLEAR ENERGY POLICY URGED

Tianjin KEXUEXUE [SCIENOLOGY] in Chinese No 1, 1981 pp 45-46

[Article by Ji Xiaohong [4694 1321 1347], Zhang Shunjiang [1728 7311 3068], and Xiong Benhe [3574 2609 0735]: "A Study on the Decision for the Development of Our Nuclear Energy"]

[Excerpt] The energy question is one of the major problems facing the world today. One of the salient manifestations of the economic crisis in the capitalist world is the energy crisis. This is by no means accidental, as energy is the major material foundation for social and economic development and for improving the livelihood of the people. A country's gross energy consumption and its per capita energy consumption are important indexes to the state of that country's economy and the level of the people's livelihodd. With regard to China, the realization of the four modernizations program will require a vast amount of energy. Whether we can achieve the large-scale development, full supply, and rational use of various kinds of energy will seriously affect the speed of China's industrial and agricultural development, the improvement of the people's livelihood, and the success or failure of the four modernizations program.

Inasmuch as energy needs are increasing very rapidly while petroleum and coal deposits are finite, mankind today should keep the coming generations in mind and not burn up as fuel all the earth's oil and coal--these valuable raw materials for the chemical industry which were produced millions of years ago through solar photosynthesis. Many countries of the world began looking for new, alternative energy sources several decades ago. After 30 years of such efforts, among the various new energy sources being developed throughout the world today, the only one that can be used industrially within the next 30 years, that can be developed on a large scale, and that is safe and clean is nuclear energy. It can be predicted that in the next 50 years, or perhaps even sooner, nuclear energy will gradually supplant petroleum and coal and become the main source of energy.

Although China's energy resources are not inconsiderable, they are not over abundant when considered on a per capita basis, in view of the large population. Furthermore, the energy resources are very unevenly distributed, and with respect to those areas such as Eastern China, Southern China, and the Northeast, where industry is developed, the population is highly concentrated, which are fairly far from the coal and oil-producing regions and are lacking in hydroelectric

resources, the energy supply problem is already fairly serious, so constructing nuclear power stations in these areas as quickly as possible is a very pressing issue. Furthermore, we have already achieved the basic conditions for developing nuclear power. In the past 20 years or so, in the course of studying nuclear weaponry, we have verified a certain number of uranium deposits and we have built a fairly sizable nuclear technology research system and a nuclear fuel industrial system. Considerable progress has been made in the manufacture of nuclear engineering equipment and in the nuclear materials industry. A contingent of people with a considerable amount of practical experience in nuclear research and nuclear engineering design has reached maturity, which means that the development of nuclear power on a large scale in China and building up our nuclear industrial system as quickly as possible is not only a matter of utmost necessity, but it is also entirely attainable. The most important issue at hand is the speedy formulation of a nationwide energy plan and the establishment of the position nuclear energy is to have among China's energy resources. In addition, we must undertake serious study and arrive at some decisions regarding how China will develop nuclear energy and formulate pertinent guidelines and policies.

CSO: 4006/323

FAR INFRARED TECHNOLOGY USED IN HEATING, DRYING

Beijing BEIJING RIBAO in Chinese 7 Apr 81 p 3

[Article by Dong Ping [2639 1627]: "Far Infrared Technology Performs in Energy Conservation"]

[Text] In recent years a new member emerged in the field of infrared technology--far infrared technology. It is a powerful tool for heating and drying and is a useful technology for conserving energy. Compared to conventional heating methods, the far infrared technique leads to high product quality and low operating cost, takes up one-third less ground area, saves 30 percent of the electricity and reduces drying time one-third to one-half. It requires simple equipment that can be modified easily and provides rapid effect.

It is well known that infrared radiation is electromagnetic waves with wavelengths longer than those of visible light. Infrared can be used in heating and drying because water molecules and molecules of most organic solvents absorb infrared radiation. Since far infrared has a much wider wave band than near infrared, it has a much higher probability of being absorbed by matter and is much more penetrating than near infrared. Therefore, the heating ability of far infrared is even better than near infrared. A far infrared radiator converts ordinary heat (such as heat produced by a resistive wire or steam heat) into far infrared radiation and irradiates the object directly. When an object absorbs far infrared radiation, the molecular vibration becomes more vigorous and the object's temperature increases. When the water molecules and organic solvent molecules in the object acquire sufficient energy and evaporate, the object is dried rapidly.

At present the surface temperature of most far infrared radiators in China is generally less than 600°C. If the temperature is too high, the radiated infrared will be near infrared instead of far infrared; some of the near infrared will become visible light and that portion of energy is simply wasted. It can be said that heating and drying with far infrared is a new technology that uses a minimum amount of energy to achieve optimum result.

In 1979, 800,000 kilowatts of far infrared equipment were used in China, and the electrical energy saved in Shanghai alone was 130 million kilowatt-hours. Today

infrared is widely used in China for baking paint, fixing color in printing and dyeing, processing rubber, manufacturing plastics, dehydrating leather, food processing, instrumentation and dozens of other applications. As the development of far infrared technology progresses, there are more and more different varieties of far infrared radiators. Far infrared heating and drying technology will play an even greater role under the demands of energy conservation.

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CSO: 4006/286

COOPERATION WITH JAPAN, FRANCE IN OIL EXPLORATION REPORTED

Successful Results

Hong Kong CHING-CHI TAO-PAO [ECONOMIC REPORTER] in Chinese No 20, 20 May 81 p 2

[Article: "Economic Prospects: Chinese-Foreign Cooperation in Developing Offshore Oil Has Bright Future"]

[Text] Victory messages relating to Sino-Japanese cooperation in the development of Bohai oil and Sino-French cooperation in the development of Nanhai oil were heard recently. Although the messages were short they were worth noting.

In May last year, Japanese and Chinese oil companies signed a contract to explore and develop oil in the southern and western sections of China's Bohai. Drilling of the first well was started on 13 December and finished on 7 March this year. This well is 3,334.5 meters deep, with oil- and gas-bearing strata more than 300 meters thick. According to an announcement concerning the results of the exploratory drilling issued jointly by the Marine Branch Company of the Chinese Oil Company and the Sino-Japanese Oil Development Company, the daily production of the well is estimated at 1,000 tons of crude oil, 600,000 cubic meters of natural gas, and 50 tons of coagulated oil. The crude oil is said to be of very high quality with low specific gravity and low sulfur content.

Also in May last year, the Nanhai Branch Company of the Chinese Oil Company and the Dahl Petroleum Company of France signed a contract for the exploration and development of Beibuwan oil in the Nanhai area. Drilling of the first well was started on 8 January this year and finished on 16 April. This well, which is 2,900 meters deep, was named "Wushi 16--No 1 Well" in early May. This well was a gusher. Tests carried out on part of the oil strata confirmed that the thickness of the oil strata as well as the pressure at the bottom of the well and other physical conditions are so favorable that nothing like this has been seen before.

Today, the eyes of the world are concentrated on energy resources. Therefore, discovery of these two gushers in China's Bohai and Nanhai cannot help but attract attention here as well as abroad, and many people have started making various

estimates. A spokesman of the Sino-Japanese Oil Development Company said in Tokyo that the quality of the oil gushing from one of the experimental wells was similar in quality to the Arabian light oil produced by Saudi Arabia. The oil strata reaches a total of 105 meters. This financial juridical person of Japan, who cooperated with China in this engineering venture, further stated that the area under exploration could very possibly prove to be an oil field with a potential yield of 10 million tons of crude oil (or 69.3 million barrels) a year. Will these two areas where gushers have been found really develop into oil fields? How big will the oil fields be? How many more wells need to be drilled? At this point we can only guess. However, foreign specialists generally consider that they are both highly hopeful.

Chinese experts are also quite optimistic about the future of developing oil in Bohai and Nanhai. According to a report, Deputy Director Ye Longfei of the Oceanography of the South Sea Institute, Chinese Academy of Sciences, has stated: The Nanhai area is rich in resources. The oil reserves of the area are believed to be richer and more concentrated than those of Southeast Asian areas, including the Philippines, Borneo, Java, Indonesia, Thailand, and Vietnam.

China is a large country with rich natural resources. However, on account of weak technological strength and limited financial power, exploratory work is lagging behind, and a large quantity of oil is still buried underground which has not been discovered or exploited. In view of the situation concerning oil production and consumption in China in the past 2 years, an energy shortage problem will soon overtake China. Therefore, finding new oil fields has become one of the most urgent projects today. At present, in addition to increasing production of the existing oil fields, expanding the range of exploitation and drilling deeper into the oil-bearing strata, China is also aggressively pursuing exploration of oil on land as well as offshore by attracting foreign firms to carry out cooperative joint ventures. Within the guideline of independence and rebirth from one's own power, an open policy is to be implemented and economic cooperation with foreign countries is to be developed. This is the new Chinese policy which, of course, applies to the realm of oil exploration also. Successful drilling of the first wells in Bohai and Nanhai, respectively, through Sino-Japanese and Sino-French cooperation has painted a bright future for further offshore oil development.

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CSO: 4006/343

High-Yield Oil, Gas Well

Guangzhou NANFANG RIBAO in Chinese 29 May 81 p 1

[Text] According to reports by NEW CHINA NEWS AGENCY reporter Huang Fengchu [7806 1144 0443], a high-yield oil and gas well drilled by a joint operation of China and a French petroleum company at North Bay in the South China Sea is the first prospecting well drilled in the North Bay area. From April 20 to May 26,

oil tests were carried out for the six sections containing oil and gas. According to test results released jointly by the South Sea Branch of the China National Petroleum Corporation and the French Dahl Petroleum Company, two sections of the well are relatively rich in oil and gas. The second section has a daily crude oil yield of 320 tons and a daily natural gas yield of 59,000 cubic meters. The third section has a daily yield of 320 tons of crude and 70,000 cubic meters of natural gas. The crude is of high quality, with low specific gravity and low sulphur content. This finding provides additional proof that this sea area is rich in oil and natural gas.

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CSO: 4006/730

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18 Aug. 1981